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GOTTLIEB (D.). **A physiological and biochemical basis for research on fungicides.**—*Bull. Torrey bot. Cl.*, lxxiii, 4, pp. 339–345, 1946.

The author draws attention to the importance of studying the fundamental structure and metabolic processes of fungi as being necessary for the solution of several problems conditioning the successful synthesis of fungicides. Hitherto, in the absence of such information, research for the development of more effective fungicides has been conducted largely by empirical methods.

He suggests that Horsfall and Zentmyer have offered a rational approach to such studies (abs. in *Phytopathology*, xxxiv, p. 1004, 1944) by determining several generic compounds normally found in all cells, and then testing the toxicity to fungus spores of various reagents employed for their analysis. These reagents were found to possess good fungistatic properties. In order to make practical use of this knowledge, it is necessary to study not only the characteristics common to all living cells, but also their specific modifications and biological transformations within the fungus.

Physiological differences between host and pathogen condition the synthesis of the ideal fungicide, which should be able to attack the spore in the early stage of germination. Marsh [*R.A.M.*, xx, p. 414] found that some spores depend for germination on external sources of carbon, such as dextrose or alcohol. An effective fungicide should be capable of withholding such nutritive materials.

Cytological investigations are required in order to determine the composition of cell walls and cell membranes and their permeability, so that means may be found to assist the passage of fungicidal molecules through the cell membranes and their arrival at the seat of specific protoplasmic activity. For this purpose, the data provided by such studies should assist the synthesis of organic chemicals by means of which a proper balance can be adjusted between hydrophilic and hydrophobic groups.

The value of a knowledge of the mineral nutrition of fungi in research for the control of plant diseases was shown by Zentmyer, who inhibited the growth of *Fusarium oxysporum* f. [*bulbigenum* var.] *lycopersici* by adding 8-quinolinol to the medium and found that, while zinc is required for the development of the fungus, it is precipitated by the reagent, with the result that the fungus is deprived of an essential nutritional element (*Science*, N.S., c, pp. 294–295, 1944).

Information is also scanty on the vitamin requirements of fungi and their role in the respiratory and metabolic mechanisms. The structure of a vitamin can be altered so that analogues are produced, the effect of which is sometimes to convert the material into an anti-vitamin inhibiting the growth-promoting activity of the original compound. Unpublished studies by the author are mentioned in which the absence of vitamin C in some fungi is recorded, although it occurs in most plants; and he asks whether the opposite might not occur and a vitamin be found which is essential to and manufactured by the fungus, but not essential to the

host. If an inhibitor of such a vitamin could be found, its injection into the host might inhibit the growth of the fungus without altering the metabolism of the plant.

Other lines of research advocated include studies of the respiratory enzymes and of the toxic specificity of the toxins which inhibit them. The paper concludes with references, *inter alia*, to the possibilities for fungicide development opened up by such work as that of Brian and McGowan [*R.A.M.*, xxiv, p. 427], in the isolation of a new antibiotic from *Trichoderma viride*, and of Geiger and Conn (*J. Amer. chem. Soc.*, lxvii, pp. 112–116, 1945), who considered that the inactivation by cysteine of antibiotics such as clavacin and penicillic acid suggested that synthetic chemicals of similar structure should make good fungicides; and to studies of the electric charge on spores, and of the specificity of fungicides.

CIFERRI (R.). **Le grandi endemie come causa di traslazione dei maggiori centri di culture agrarie coloniali.** [The great endemics as a cause of the transfer of the larger centres of colonial agrarian crops.]—*Scientia*, xxxv, pp. 103–112, 1941. [Received February, 1946.]

The author puts forward the view that one of the reasons for the removal of the cultivation of important colonial crops from their original habitats to other parts of the world has been the presence of endemic diseases at the original sites. This thesis is illustrated by well-known examples of crop movements in sugar-cane, *Hevea* rubber, cacao, and coffee due to the disease factor.

COOKE (T. F.) & VICKLUND (R. E.). **Tropical testing chamber.**—*Industr. Engng Chem.*, Analyt. Ed., xviii, 1, pp. 59–60, 4 figs., 1 diag., 1946.

The tropical testing chamber of the Engineer Board was established at Fort Belvoir, Virginia, in the latter part of 1944 for the testing of resistance to tropical deterioration of many items of equipment, including cork, fabrics [*R.A.M.*, xxv, p. 410], leather [ibid., xxv, p. 409], rubber, wood and its products (such as paper), and materials used in the construction of electrical and electronic apparatus [ibid., xxiv, p. 379]. The chamber measures 14 ft. in width, 32 ft. in length, and 12 ft. in height, and is furnished with three layers of wall, the outer of brick, 9 in. thick, the middle of asphalt-impregnated mineral wool, 4·5 in., and the inner of transite, 0·375 in. The outer layer of the ceiling is an asphalt slag roof, next comes a layer of celotex, 1·5 in. thick, then a metal deck, a layer of asphalt-impregnated mineral wool 6 in., below it a 2-ft. air space, and finally a transite ceiling 0·375 in. The humidity and temperature within the room are controlled by heating and cooling coils, and a fan produces an air movement with a velocity of 4 to 5 miles an hour. For 18 hours a day the relative humidity is maintained at 90 ± 2 per cent. and the temperature held at $85° \pm 1°$ F., and for six hours the corresponding values are 95 ± 2 per cent. and $75° \pm 1°$. The condensation produced by this regular cycle provides a film of water ideal for fungus growth. The materials were inoculated with spore suspensions of 24 fungi, chiefly from the Pacific area.

SCHEFFER (T. C.) & DUNCAN (CATHERINE G.). **Fungistatic vapors for control of mold in packages and equipment.**—*Industr. Engng Chem.*, xxxviii, 6, pp. 619–621, 1946.

Tests are reported on the efficacy of the vapour phases of 47 chemicals in combating the moulding of sweet gum [*Liquidambar styraciflua*] sap wood, leather, malt agar, and pressure tape in closed containers by *Aspergillus*, *Penicillium*, *Stachybotrys*, *Stysanus*, *Chaetomium*, *Metarrhizium*, and *Memnoniella* spp. The work was carried out during the war in response to a request for advice as to the fungistatic treatment of certain military supplies and equipment [cf. preceding abstract] on which the use of preservative solutions would have been impracticable.

Some of the most promising compounds were benzaldehyde, 2-chloropyridine, ethyl mercuric chloride, and *ortho*-chlorophenol.

Zuck (R. K.) & Diehl (W. W.). **On fungal damage to sun-exposed Cotton duck.**—*Amer. J. Bot.*, xxxiii, 5, pp. 374–382, 2 pl., 1 graph, 1946.

Macroscopic and microscopic examination by the aid of reflected and transmitted light, mechanical tests, and reinoculation experiments have permitted the activities of the angiocarpous fungi, *Diplodiella cowdellii*, *Hendersonia sarmentorum*, *H.* sp., *Leptosphaeria* sp., *Diplodia* sp., *Phoma herbarum*, and *Ophiobolus* sp., as important decomposing agents of grey duck in particular, and cellulose in general, to be studied [cf. preceding abstracts]. The fungi grow usually only on the shaded surface of fabrics exposed in Florida and Louisiana at an angle of 45° facing south and only after long periods of exposure. Growths of *Alternaria* sp. and other Hyphomycetes precede the attacks by the angiocarpous fungi but apparently without weakening the fabric. A quantitative method is offered for assessing fungal, as distinct from non-biological, injury, and as a possible means of testing localized differential resistance to puncture and bursting which cannot be done by the techniques commonly used hitherto. The sodium hydroxide-carbon disulphide swelling test disclosed the beaded pattern on fibres from the clear areas but not from the dark fungus-infested areas of fabric exposed from 3 to 18 months. The results show that the fungus-infected areas become progressively weakened, but some areas of fabrics may remain undamaged even after 18 months' exposure. Grey duck, however, which consists of natural fibres with adhering fragments of seed coats, spun and woven, possesses a far higher liability to mildew than the fibres alone; bleaching and scouring should reduce this. Grey duck exposed at Baltimore for $2\frac{3}{4}$ years and mineral khaki exposed in Florida for 6 and 12 months showed some fungal attack but rarely any fructifications, while the fabric was equally weak in the attacked and in the clear areas.

Cook (R. P.) & Brown (Margaret B.). **Penicillin production on fractions from the Pea (Pisum sativum).**—Abs. in *Bio-chem. J.*, xl, 3, p. xxxiv, 1946.

By means of ethanol (80 per cent. v/v) precipitation fractions may be made from aqueous extracts of ground dried peas or the juice from green peas in pod which stimulate the growth of *Penicillium notatum* 1249 B21 [*R.A.M.*, xxv, p. 408] in surface culture on a basal medium described by R. P. Cook *et al.* in *Bio-chem. J.*, xxxix, p. 314, 1945. The penicillin yield is proportional to the dry-matter concentration of the fraction, reaching a maximum yield of at least 200 units per ml. at a value of 2 gm. per 100 ml. medium. The ethanol-precipitable fraction contains nitrogenous compounds and complex polysaccharides.

The salts of the basal medium play an important part in penicillin production, the addition of sodium chloride or crystallized magnesium sulphate enhancing yield and that of sodium nitrate or potassium phosphate depressing or inhibiting it, without affecting the growth of the mould. The substitution of glucose for lactose also inhibits penicillin production.

Foster (J. W.), Woodruff (H. B.), Perlman (D.), McDaniel (L. E.), Wilker (B. L.), & Hendlin (D.). **Microbiological aspects of penicillin. IX. Cottonseed meal as a substitute for Corn steep liquor in penicillin production.**—*J. Bact.*, li, 6, pp. 695–698, 1946.

Cottonseed meal was found to be at least as good as maize steep liquor for penicillin production by the Demerec X1612 and Wisconsin Q strains of *Penicillium chrysogenum* [*R.A.M.*, xxv, p. 352]. In fact, in the absence of chemical precursors of the stimulating phenylacetyl-derivative type [ibid., xxv, p. 130], cottonseed meal is considerably superior to maize steep liquor for the object in view.

P. chrysogenum required an adaptation to lactose for the most rapid and efficient utilization of this carbohydrate in laboratory fermenters.

Rao (R. R.), Rao (S. S.), & Venkataraman (P. R.). **Utilization of Groundnut-cake hydrolysate as medium for production of streptomycin.**—*Nature, Lond.*, clviii, 4,001, pp. 23–24, 1946.

The inoculation with a spore suspension of *A[ctinomyces] griseus* of enzyme digest of groundnut-cake enabled antibiotic activity against *B[acillus] subtilis* to be determined within 48 hours of inoculation, and maximum activity was reached between the fifth and sixth day. Using the Schatz-Waksman media [*R.A.M.*, xxiv, p. 426], however, the presence of streptomycin was detected only between the fourth and fifth, and maximum activity occurred between the eighth and ninth, days.

Waksman (S. A.), Geiger (W. B.), & Reynolds (D. M.). **Strain specificity and production of antibiotic substances. VII. Production of actinomycin by different Actinomycetes.**—*Proc. nat. Acad. Sci., Wash.*, xxxii, 5, pp. 117–120, 1946.

In the course of the authors' experiments [*R.A.M.*, xxv, p. 308] the variation of antibiotic production according to the isolations used was demonstrated by one organism yielding some 10 times more, and another less, actinomycin than the original *Streptomyces antibioticus* although the less productive extract was purer. The antibiotic spectrum of actinomycin B, the second fraction associated with actinomycin, was similar to the latter, but variable for different isolations as regards its nature and activity. The negligible yields of the B fraction and the possibility that its activity derives from traces of actinomycin A present as impurities have led to the substitution of 'actinomycin' for actinomycin A and the discarding of the name 'actinomycin B'.

Marchionatto (J. B.). **Argentine Republic. Wilting of the terminal bud in Potato.** —*Int. Bull. Pl. Prot.*, xv, 9, pp. 161 M–162 M, 1941. [Received July, 1946.]

During 1937–8 and 1938–9, potato crops, especially of the Green Mountain variety, suffered severe damage in the Argentine as a result of attack by a new disease termed locally 'marchitez del brote terminal' (terminal bud wilt) and subsequently ascertained by A. M. Offermann and E. R. Vitoria to be due to *Solanum* virus 1 [potato virus X: *R.A.M.*, xx, p. 548]. The chief symptoms were etiolation of the bud tip, ring-shaped markings on the leaves, and necrosis of the buds, aerial stalks, and tubers. Severely attacked tubers caused only limited spread.

Minkiewicz (S.). **Poland. Chief diseases and pests observed in 1940.**—*Int. Bull. Pl. Prot.*, xv, 1, pp. 4 M–6 M, 1941. [Received July, 1946.]

Among the items recorded in this paper it is stated that new foci of wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xvi, p. 832] were found in 1940 in the districts of Cracow and Warsaw.

Blattný (C.). **Vorläufige Mitteilung über die Rassen des Kartoffelkrebses Synchytrium endobioticum (Schilb.) Perc.** [Preliminary note on the races of the Potato wart *Synchytrium endobioticum* (Schilb.) Perc.]—*Ann. Acad. tchéchosl. Agric.*, xvii, 1, pp. 40–46, 1942. (Czech, with German summary.) [Abs. in *Neuheiten PflSch.*, xxxv, 3–4, pp. 83–84, 1942. Received March, 1946.]

The following physiologic races of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xxiii, p. 405] were differentiated by the study of a copious supply of Central European material: (*a*) mountain race group SB, comprising collections from southern Bohemia, the Bohemian Forest (Czechoslovakia), possibly Vorarlberg, eastern Moravia, the mountains of the former Carpathian Russia, and the

border zone between northern Moravia and north-eastern Bohemia; (*b*) east German lowlands race-group, converging with NB in Schluckenau and northern Bohemia, and (*c*) west German race-group, possibly identical with (*a*). The existence of physiologic races of the pathogen explains why certain potato varieties, e.g., Curba and Roode Star, are susceptible in some countries and immune in others, and further accounts for the variable symptoms of the disease on the aerial organs (normal excrescences, quite insignificant galls, or mere subinfections) according to the place of origin of the host and fungus.

The practical applications of the discovery of racial specialization in *S. endobioticum* include field tests in the several areas harbouring different races; specification of morphological dissimilarities, if any, as an aid to diagnosis; revision of the resistance of individual varieties by tests with the various races; and stringent supervision of the export of tubers from the infested areas of each of the above-mentioned geographical zones.

Résultats des expériences faites avec diverses variétés de Pommes de terre à Câmpia Turzii, 1937–42. [Results of tests with potato varieties at Câmpia Turzii, 1937–42.]—*Anal. Inst. Cerc. agron. Român.*, xv, pp. 169–170, 1945.

In a comparative survey of potato varieties long cultivated in Rumania and of those imported from Germany during 1940 and 1941 in order to provide varieties resistant to black scab [wart disease: *Synchytrium endobioticum*: see preceding abstract], to which native varieties are susceptible, Goldball showed the highest yield over the period 1937 to 1941, but owing to its susceptibility to wart disease has had to be replaced by the German varieties, Frühbote and Frühmölle.

Foëx (É.). **La lutte contre le mildiou Phytophthora infestans (Mont.) de Bary de la Pomme de terre.** [The control of Potato blight, *Phytophthora infestans* (Mont.) de Bary.]—*C.R. Acad. Agric. Fr.*, xxvii, 4, pp. 219–229, 1941. [Received August, 1946.]

This is a brief critical discussion in popular terms of the control measures generally adopted in most countries against potato blight (*Phytophthora infestans*), reference being made to resistant varieties, fungicidal treatments, spray warnings, and the destruction of the haulms of seed potatoes by sulphuric acid. During 1938, Dufrénoy in the Hautes-Pyrénées and Limasset at Versailles both confirmed the validity of Beaumont's two conditions for infection, i.e., minimum temperature not lower than 10° C. and relative humidity not under 75 per cent. for two consecutive days [*R.A.M.*, xvi, p. 514.]

Crépin (C.) & Bustarret (J.). **Quelques problèmes de l'amélioration de la Pomme de terre.** [Some problems related to the improvement of the Potato.]—*C.R. Acad. Agric. Fr.*, xxvii, 18, pp. 1014–1024, 1941. [Received August, 1946.]

The authors record a very severe outbreak of late blight [*Phytophthora infestans*] of potato in France in 1941, following an earlier heavy infection by *Rhizoctonia* [*Corticium solani*]. Destructive attacks of blight of this kind are attributed to the increased planting of the susceptible Bintje (or Dikke Muizen) variety, which had largely replaced Industrie (Ronde Jaune) over much of the northern part of France.

Pending the establishment of sufficient spray-warning stations to render spraying effective, the use of resistant late varieties is urged. Ackersegen and Cellini, semi-late varieties of mediocre quality, show good resistance, and the authors consider, as the result of their work, that this quality could be bred into new resistant strains. Such new varieties should also be resistant to wart [*Sychytrium endobioticum*].

In tests, the progeny of Cellini crossed with a German hybrid between potato and *Solanum demissum*, were nearly all more resistant than Cellini itself.

LARGE (E. C.), BEER (W. J.), & PATTERSON (J. B. E.). **Field trials of copper fungicides for the control of Potato blight. II. Spray retention.**—*Ann. appl. Biol.*, xxxiii, 1, pp. 54–63, 1 fig., 1 graph, 1946.

The authors' second study of this subject [*R.A.M.*, xxv, p. 314] gives the results of experiments made during four seasons at Dartington, south Devon, to determine the spray-retention capacity of copper fungicides, including Bordeaux mixture, cuprous oxide, copper oxychloride, and finely divided metallic copper, for the control of *Phytophthora infestans*. Maincrop potatoes were twice sprayed, first with about 120 gals. and second with 160 gals. to the acre. After three to four weeks, with 2½ to 3½ in. rain, 1 per cent. Bordeaux mixture showed 40 per cent. spray retention, that of cuprous oxide and copper oxychloride at the same copper dosage with water-soluble dispersing agents was less than 20 per cent.; adhesion was sometimes improved by the addition of bentonite as an insoluble sticker. More frequent spraying with 0·5 per cent. Bordeaux mixture and other low-copper fungicides assured adequate deposits. A quick method for estimating total foliage expansion is described and its importance for estimating spray retention, together with that of spray timing near the time of maximum expansion, is emphasized. Sprayed potato leaves were experimentally shown to have a copper content of about 0·02 mg. copper per 120 sq. cm. over that of unsprayed leaves.

The disk method of estimating spray retention, using four to six independent samples per treatment, was found reliable within ±10 per cent. By using an alternative battery-washing, whole-leaf method [which is described], an increased copper deposit of 30 per cent. over that detected by the disk method was recorded, attributable to the denser copper deposits (already shown in a preliminary experiment) in the leaf tips; these were not included in the disk samples.

The general conclusion from all experiments undertaken was that effective protection against blight under relatively severe incidence can be assured by maintaining a coverage of not less than 0·5 mg. copper per 120 sq. cm. over the whole expanse of the foliage; and that any of the fungicides tested afford equally good control provided that sufficient applications are made, according to the copper dosage or the adhesive properties of the compounded spray material or both, so that the requisite concentration of copper is maintained on the leaves.

THOMAS (J. D.). **Two aids for the study of Potato-late-blight epidemiology.**—*Phytopathology*, xxxvi, 4, pp. 322–324, 1 graph, 1946.

An accurate measure of viable inoculum and an assessment of the environmental factors influencing infection and pathogenesis are essential to the study of plant-disease epidemics. In 1943 the writer exposed at the Minnesota Agricultural Experiment Station potted potato plants that had been raised in a greenhouse under conditions precluding accidental contamination by late blight (*Phytophthora infestans*). At the end of the exposure periods (either overnight or for four hours during the day) the plants were transferred to the laboratory and incubated at 70° F. and 100 per cent. relative humidity. Late-blight lesions usually began to appear three to four days after the exposure of the plants; they were counted and their numbers, together with those of the sporangia trapped on vaselined slides simultaneously exposed, were used to determine the 'blight-infection' potential. None of the control plants, taken direct from the greenhouse and incubated under identical conditions with the foregoing, contracted the disease.

An estimate of the viable inoculum at a given place being available, predictions regarding blight development will depend on an exact knowledge of the environmental factors affecting spore germination and infection [*R.A.M.*, iii, p. 173; xxiv, p. 468, *et passim*]. To compare the meteorological conditions in the atmosphere with those among the plant foliage, or 'foliarsphere', temperature and humidity were measured among the leaves of potato plants in the field and also at a point

5 ft. above the rows. The relative humidity was measured by means of dew-point apparatus. The temperatures in the two locations were found to differ only slightly, but there were frequently striking disparities in relative humidity, notably on 8th, 12th, and 14th July, on which dates the values (at mid-day) in the 'foliarsphere' and atmosphere were approximately 80 and 55, 100 and 70, and 90 and 70 per cent., respectively. On 2nd and 12th July 0·3 in. rain fell. Late blight was observed in the field on the 7th and increased from then until the 19th. Judged by conventional meteorological criteria, the weather during this period was not conducive to blight development, but the higher relative humidities in the 'foliarsphere' probably provided favourable moisture conditions over a sufficient period to permit fructification of the fungus and germination of the inoculum.

FOURMONT (M. R.). **Technique rapide pour les essais d'efficacité de produits chimiques contre le mildiou de la Pomme de Terre.** [A rapid method for testing the efficacy of chemical products against Potato blight.]—Reprinted from *C.R. Acad. Agric. France*, ccxxi, 30th May, 1945, 3 pp., 1945.

Bintje potato plants in pots were given three treatments of various chemicals against *Phytophthora infestans*, placed next day in a cellar at 12° to 14° C., sprayed with a suspension of the fungus, covered with a cloche, and left for 24 or 48 hours. The cloches were then removed and the plants returned to the greenhouse, the first lesions appearing six to seven days after inoculation.

On the twelfth day following the chemical treatments two untreated controls showed, respectively, 11 and 12 lesions, two plants treated with 1 per cent. Bordeaux mixture (250 gm. copper per hectol.) and two with copper acetate containing 11 per cent. copper and used at 2 per cent. (220 gm. copper per hectol.) showed no lesions, while those treated with a cupro-arsenical material containing 10 per cent. copper and used at 2 per cent. (200 gm. copper per hectol.) had 3 and 1; with an organo-cupric complex containing 18 per cent. copper, and used at 1 per cent. (180 gm. copper per hectol.) 2 and 0; with an organic D (no copper) 7 and 9; and the one plant tested with an organic product E (no copper) 13 lesions.

It is claimed that this method enables the value of different fungicides to be estimated in 12 days. A field test of the more satisfactory materials should follow.

WHITE (N. H.). **Host parasite relations in pink rot of Potato.**—*J. Aust. Inst. agric. Sci.*, xi, 4, pp. 195–197, 1946.

Investigations carried out in the Plant Pathology Laboratory, Department of Agriculture, Tasmania, showed that in an inoculated potato tuber partly invaded by *Phytophthora erythroseptica* three distinct zones are observed, one of living, uninvaded tissue, a second of invaded, but living tissue, in which the fungus behaves as a true parasite, and a third of invaded but dead tissue which gives a characteristic pink coloration when exposed to oxygen. In this dead tissue the fungus lives on saprophytically. An oxidizing reaction by tyrosinase due to the mixing of cell metabolites in the presence of oxygen after death is responsible for the colour changes in the dead zone. Following the invasion of the tissue by *P. erythroseptica*, the intercellular mycelium causes the host cells to become increasingly permeable and the phosphorylated compounds to be decomposed. This leads to decompensated respiration and to the death of the tissue. It is not known how the permeability of the cells is altered by the fungus.

NATTRASS (R. M.). **Note on the bacterial wilt disease of the Potato in Kenya.**—*E. Afr. agric. J.*, xii, 1, p. 30, 3 figs., 1946.

The author reviews the symptoms of the disease previously described by him [*R.A.M.*, xxiv, p. 200] and then thought to resemble *Corynebacterium sepedonicum*, on the basis of the putty-like, rather than slimy consistency of the bacterial

exudant and lack of discoloration of the vascular tissue in either stem or tuber. Cultures of the pathogen have been identified by W. J. Dowson as an atypical strain of *Xanthomonas solanacearum*, which thus differs in its effects on the host from all other described strains in not staining the vascular tissue in either potatoes or tomato. Some differences in cultural characters are also reported by Dowson.

Inoculation tests with this organism in Kenya, and general observations show it to be highly virulent on potato and tomato, but not on tobacco. It thus resembles Wager's South African strain [ibid., xxiv, p. 49]. Inoculations of tobacco leaf midribs, while producing no systemic infection, caused a slow necrosis of the tissue, from which the bacteria were recovered 78 days later.

BALDACCI (E.). **Sterility of Rice panicles.**—*Int. Bull. Pl. Prot.*, xv, 6, pp. 114M–116M, 1941. [Received July, 1946.]

Rice panicle sterility, while it has often been associated in Italy with 'brusone' or blast (*Piricularia oryzae*) [cf. *R.A.M.*, xvii, p. 61], is now considered to be mainly of physiological origin, and related to certain soil factors as yet undetermined.

CUNNINGHAM (I. J.). **Bluestone topdressing pays on copper-deficient peat land.**—*N.Z. J. Agric.*, lxxii, 3, p. 261, 1946.

Copper sulphate top dressings are recommended as a corrective for copper deficiency common on the peat soils of New Zealand, the cost per farm averaging £10 for the copper sulphate plus the cost of labour for applying it, which should be done in autumn in conjunction with the normal top dressings. The immediate object of the treatment in the present paper was the control of the 'peat scours' copper deficiency disease in dairy cattle and the raising of the average butterfat production.

LEHR (J. J.). **Over de betekenis van borium voor de landbouw.** [On the importance of boron in agriculture.]—*Meded. bot. Lab.* (*Mus.*) *Rijksuniv. Utrecht* 2, 193 pp., 7 graphs, 1 map, 1940. [English summary. Received July, 1946.]

This is a fully tabulated survey and discussion of the author's observations and experiments in Holland on boron deficiency of the soil, especially in relation to two well-known diseases associated with a shortage of the mineral, viz., beet heart rot and turnip brown heart. Outstanding contributions to the relevant literature are reviewed and a three-page bibliography is appended.

SĂVULESCU (ALICE). **O nouă boală pe Carthamus tinctorius L. (șofranaș), produsă de ciuperca Macrosporium carthami Săvul.** [A new disease of *Carthamus tinctorius* L. (Safflower), caused by the fungus *Macrosporium carthami* Săvul.] —*Anal. Inst. Cerc. agron. Român.*, xv, pp. 213–214, 1945.

This new disease of safflower caused by the fungus *Macrosporium carthami* [*R.A.M.*, xix, p. 116] was first noticed in 1940. Spots appeared on both sides of the leaf surface and, in cases of serious infection, on the branches and stem; flowering is considerably or entirely arrested, and great damage is done. The fungus forms a dark mycelium on the plant and conidiophores on the leaf surface. Conidia and a resistant mycelium were found on the seed coat.

The optimum temperature for the germination of the spores is 23° C. and germination took place up to 29°. The spores tolerate a temperature of 0° and death occurs after holding them for 20 hours at 40°. A rather low humidity is sufficient for germination, and they resist dry atmospheres well. The fungus was grown in culture on Czapek, malt agar, and maize meal agar. There was, however, no spore formation, but a resistant mycelium appeared in about three days, the most favourable pH being 6·6.

A temperature of about 25° is required for the development of infection in the field, and humidity for its expansion. When temperatures rise or dry weather continues, the disease does not make much progress. Infection is produced by spores from the soil, fallen leaf-refuse, by wind-borne spores and by resistant mycelium on the seed.

Of seven varieties of safflower cultivated in Rumania, the local, Giessen, and Krasnodar varieties are resistant, and the Bessarabian, Yenica [? Yenidje], Anatolian, and Pavlikeni susceptible. Experiments undertaken with this fungus indicate that it is restricted to a single host. Safflower is attacked either before or during flowering and only in favourable conditions of temperature and humidity.

The cultivation of resistant, high-yielding varieties such as the local and, secondly, Giessen, burning of infected plants and plant refuse, and abstention for some years from growing the crop on land where the disease has occurred, are measures recommended for control. Seed-disinfection with mercurials did not give control.

Mehta (P. R.), Singh (B.), & Bose (S. K.). **Some new hosts of Sclerotinia sclerotiorum (Lib.) De Bary.**—*Curr. Sci.*, xv, 6, pp. 171–172, 2 figs., 1946.

Butler and Bisby have recorded the hosts of *Sclerotinia sclerotiorum* in India [*R.A.M.*, xi, p. 545], and Mundkur has given a comprehensive account of the taxonomy of the fungus and its parasitism on *Hibiscus sabdariffa* [ibid., xiv, p. 106]; he was the first worker in India to induce apothecial formation in culture. In February, 1946, *Eruca sativa*, grown mainly as an oil-seed crop in the United Provinces, was severely attacked by *S. sclerotiorum*, which formed scattered, elongated, sometimes concentrically zonate lesions on the stems and finally encircled them. The diseased portions were overrun by a white, cottony mycelium, embedded in which were black sclerotia, 2 to 12 (average 6) mm. in diameter. The ground was littered with these organs, up to 78 per sq. ft. being counted in areas of intensive infection. In moist patches apothecia arose from sclerotia buried in the soil, this being apparently the first record of their natural occurrence in India. The stipe measures 25 to 88 mm. in length and is fawn-coloured where exposed, brown or dark brown within the soil. The mature apothecia are 6 to 9 mm. across, cartridge-buff to pale ochraceous-salmon, turning cinnamon- or Mars-brown (Ridgway) with senescence, and are generally borne 6 to 10 mm. above soil-level. The asci contained in these bodies measured 108 to 153 by 4·5 to 8·1 (average 122·9 by 5·9) μ, and the ascospores 7·2 to 11·7 by 3·6 to 5·4 (8·9 by 3·9) μ. The dimensions of the asci and ascospores differ from those given by Mundkur [loc. cit.], but agree with those of a culture supplied by the Imperial Agricultural Research Institute, New Delhi. No cultural differences were observed between the isolates of *S. sclerotiorum* from *E. sativa* and those from *Brassica juncea* and coriander, which were also infected in a very mild form.

Chowdhury (S.). **Control of Cercospora blight of Til.**—*Indian J. agric. Sci.*, xv, 3, pp. 140–142, 1945.

The sesame blight caused by *Cercospora sesami* is a serious disease in Assam [*R.A.M.*, xxiv, p. 219], where it causes an average annual yield reduction of 5 per cent. The pathogen is perpetuated by infected seeds and plant residues in the field. Chemical seed treatments were ineffectual against the disease, but half an hour's immersion in water heated to 128° F., as recommended by Nusbaum [ibid., xxi, p. 44], gave excellent results in large-scale field plantings in 1943 and 1944. After one year's storage the seeds were free from superficial contamination but the fungus still persisted in the interior.

RHIND (D.) & SETH (L. N.). **The fungi of Burma.**—*Indian J. agric. Sci.*, xv, 3, pp. 142–155, 1945.

This is a partial list, compiled mainly from various publications, of the fungi of Burma, the study of which has been seriously hampered by the loss, during the evacuation of the country in 1942, of most of the laboratory records and herbarium specimens, the latter numbering over 700.

MOESZ (G. v.). **Neue Pilze aus Lettland.** [New fungi from Latvia.]—*Bot. Közl.*, xxxviii, 1–2, pp. 68–73, 5 figs., 1941. (Hungarian.) [Abs. in *Neuheiten PflSch.*, xxxvi, 1, p. 4, 1943. Received March, 1946.]

Selenophoma calamagrostidis Moesz & Smarods causes spotting of living *Calamagrostis epigeios* leaves. *S. septorioides* Petr., the agent of *Astragalus* leaf spot, is distinct from *S. septorioides* R. Maire on *Arundo donax*, and the former species is accordingly renamed *S. petrakii* Moesz. *Ascochyta hieraciicola* M. & Sm. forms large lesions on cultivated *Hieracium villosum* leaves, while *Cylindrosporium arundinaceum* is responsible for a smaller foliar spot of *Calamagrostis arundinacea*.

BONAR (L.). **Studies on some California fungi. III.**—*Mycologia*, xxxviii, 3, pp. 339–345, 1946.

These studies of 16 Californian fungi, include the following items of interest. The range of *Coleroa chaetomium* (Kze) Rabh. var. *americana* Petrak (*Ann. mycol., Berl.* xx, p. 181, 1922), originally described from material collected in the State of Washington, is extended by the discovery of a somewhat severe infection of the leaves of *Rubus leucodermis* plants in Trinity county, north California, and may endanger the nearly related cultivated raspberries. The glabrous perithecia of this variety distinguishes it from the European species, *C. chaetomium*.

Guignardia camelliae is recorded on living tea leaves [*R.A.M.*, xxi, p. 166] in the Strybing Arboretum, Golden Gate Park, San Francisco, California. As the host plants were grown from seed and no other tea plants are known from the vicinity, the appearance of the fungus in this area is surprising.

Ascochyta salicis, n.sp., found on living leaves of *Salix laevigata* in Monterey county, California, is assigned to the genus *Ascochyta*, as the mature conidia in the extruded cirrhi are usually uniseptate, although a fraction of 1 per cent. of them may develop a second septum. The fungus produces scattered, angular spots, 2 to 10 mm. in diameter. The pycnidia are hypophyllous, with membranaceous, carbonaceous walls, and measure 80 to 145 μ in diameter. The conidia are fusiform, straight, or slightly curved, uni- or very rarely biseptate, and the conidiophores very short and blurred, up to 5 μ long.

WEHMEYER (L. E.). **Studies on some fungi from north-western Wyoming. II. Fungi Imperfecti.**—*Mycologia*, xxxviii, 3, pp. 306–330, 22 figs., 1946.

These studies of 35 Fungi Imperfecti found in north-western Wyoming include 20 new species, of which 13 are *Phoma*, and one new combination. One of the new species, *Hendersonia pinicola*, found on living needles of *Pinus murrayana*, is described as presenting small, irregular, black, paint-like agglomerations of conidia, discharged from globose pycnidia, 100 to 150 μ in diameter, entirely sunken in the leaf mesophyll and opening by a minute ostiole. The pycnidial wall consists merely of the subhymenial prosenchyma and a few immersed host cells. The conidiophores are short, 5 to 6 μ in diameter, and the conidia fusoid-ellipsoid to clavate, brown, unicellular at first, ultimately quadricellular, and not constricted at the septa, 14 to 20 by 5 to 7 μ.

Arwidsson (T.). **Einige parasitische Pilze aus Juan Fernandez und der Osterinsel.** [Some parasitic fungi from Juan Fernandez and Easter Island.]—*Svensk. bot Tidskr.*, xxxiv, 4, pp. 293–300, 1 fig., 1940. [Received July, 1946.]

Included in this critically annotated list of one Ascomycete, one smut, and ten rusts from the Skottsberg collections in Juan Fernandez and Easter Island is *Cerotelium fici* on fig [*R.A.M.*, xxiii, p. 316] in the latter locality.

Singer (R.) & Smith (A. H.). **Proposals concerning the nomenclature of the gill fungi including a list of proposed lectotypes and genera conservanda.**—*Mycologia*, xxxviii, 3, pp. 240–299, 1946.

Lectotypes of 198 genera of Agaricaceae are proposed for acceptance, validation, or rejection by International Congress. Eight desiderata are set out for the selection of lectotypes, the absence of which in many of the older genera has tended to make orderly taxonomy impossible.

Thom (C.) & Raper (K. B.). **Aspergillus or what?**—*Science*, N.S., ciii, 2686, p. 735, 1946.

The authors advocate the international recognition of *Aspergillus* for both ascosporic and conidial forms of the fungi belonging to this genus.

Karling (J. S.). **Brazilian Chytrids. VIII. Additional parasites of rotifers and nematodes.**—*Lloydia*, ix, 1, pp. 1–12, 53 figs., 1946.

Continuing his studies on Brazilian chytrids [*R.A.M.*, xxv, p. 423], the author describes two new species of *Olpidium*, *O. granulatum* and *O. rotiferum*, which were found parasitizing rotifer eggs and adults in Matto Grosso and Amazonas, and one of *Phlyctochytrium*, *P. nematodeae*, on nematode eggs and adults, the only known species of the latter genus attacking animals and apparently non-pathogenic to algae. Rotifer eggs and adults were also found to be infected by *Rhizophydium gibbosum*, *R. zoophthorum*, *Endochytrium operculatum*, and *Catenaria anguillulae* in the same States.

Kostov (D.) & Georgievna (Mme R.). Устойчивость на мозаичния вирусъ. I. Устойчиви тютюни на мозаичния вирусъ, получени чрезъ кръстосване. II. Наследяване на некротичната реакция и селекционната стойность на формата **Nicotiana tabacum var. virii.** [Resistance to Tobacco mosaic virus. I. Tobacco varieties resistant to mosaic virus experimentally produced. II. Inheritance of necrotic reaction and plant-breeding value of the strain *Nicotiana tabacum* var. *virii*.]—*Центр. Земед. Изслед. Контр. Инст., София*, [*Centr. agric. exp. contr. Inst., Sofia*], 56 pp., Sofia, 1944. [English translation. Received July, 1946.]

In continuation of his studies on tobacco mosaic [*R.A.M.*, xvii, p. 349] the first author states that for breeding resistant varieties reacting with local necrosis, the theoretical aspects of which were previously discussed, he tried two different hybrids, (1) (*Nicotiana rustica* RL, a variety reacting with local lesions only, × *N. tabacum*) × *N. digluta*, and (2) *N. tabacum* var. Basma × *N. digluta*. They were back-crossed either twice (1) or once (2) to *N. tabacum* var. Basma (used as female parent since it was found that the pollen from the hybrids gave more uniform results), then selfed, and the offspring selected in these and subsequent generations were those which reacted with local necrosis only, were most tobacco-like, and were fertile. From the F_6 generation from hybrid (1) a desirable variety homozygous for local necrosis, having 48 chromosomes and named *N. tabacum* var. *virii*, was selected for use in succeeding crosses.

The object of the second series of experiments done in collaboration with R. Georgievna was to transfer the necrotic reaction of *N. tabacum* var. *virii* to

the background of commercial varieties. Using the same selecting principles as before a cross between this new variety and No. 36 (Nevrocop Basma) gave in the F_3 generation three families homozygous for local necrosis, while another cross with the variety American White gave a single homozygous family in the F_2. Progeny of the hybrids between *N. tabacum* var. *virii* and the large-leaved varieties Virginia Brightleaf and Florida Black Shank Res. No. 301, while showing only local necrosis, had a large proportion of abortive pollen, and no results are given beyond the F_2.

The F_1 hybrid (*N. tabacum* var. *virii* × American White above) was used as one parent in a series of triple crosses with the following varieties, some of which are small-leaved like the parents and some large-leaved, Ustinsky No. 4, Trapezund, No. 36 Nevrocop Basma, Dubeck, Dzebelska Basma, Havana, Gold Dollar, Maryland Broadleaf, Virginia Brightleaf, One Sucker, *N. tabacum* var. *macrophylla*, and *N. syrii*. The F_1 hybrid (*N. tabacum* var. *virii* × No. 36 Nevrocop Basma) was similarly used with Varatik, Virginia, Faucett special, One Sucker, and *N. tabacum macrophylla*.

The progeny were selfed and gave rise to a large population of desirable forms all, or a large proportion, having the local necrotic character (some homozygous) which can be used for further experiments together with hybrids between *N. tabacum* var. *virii* and the tolerant American variety Ambalema [ibid., xxii, p. 308; xxiii, p. 499, *et passim*]. Such families, heterozygous, however, in respect of other morphological and physiological characters, may be used in different localities under varying environmental conditions for isolating desirable resistant varieties suitable to the different regions.

It was noted during the experiments that some plants reacted with 'flowing necrosis' at temperatures lower than 30° to 35° C. This, together with the fact that plants apparently similar genetically and inoculated under the same conditions at the same time, may react differently, suggests that the manifestation of flowing necrosis may depend on the genetic make-up as well as on temperature. If a gene-modifier is responsible for reaction at the lower temperature, then it is considered likely that a gene combination might be obtained which would raise the critical temperature so that the plant would react only at temperatures much higher than 30° to 35° C.

Rawlins (T. E.), Roberts (Catherine), & Utech (N. M.). **An electron microscope study of Tobacco mosaic virus at different stages of infection.**—*Amer. J. Bot.*, xxxiii, 5, pp. 356–363, 3 figs., 5 graphs, 1946.

In the course of electron-microscope studies preparations of purified tobacco mosaic virus from leaves infected for five days were found usually to contain more double-length particles than similar preparations from leaves infected for 20 days, thus confirming the results of Spencer's sedimentation researches [*R.A.M.*, xxi, p. 392]. Whether these particles result from a gradual lengthening of virus particles while present in the host or whether they represent a length-wise union of two characteristic particles some 300 mμ long has yet to be determined. Many particles in five-day virus exceeded 450 mμ in length, which may explain the findings of Stanley [ibid., xvii, p. 407] and Spencer [loc. cit.] who recorded fewer local lesions produced by a given weight of purified 7- and 5-day virus than by the same weight of 28- and 20-day virus.

The authors show that purification by alternate high and low speed centrifugation while the virus is suspended in dilute phosphate-hydrochloric acid solution, causes less tendency to lengthwise union of the particles than similar purification of virus suspended in distilled water.

The proportion of particles having an approximate length of 300 mμ is very high, their length being apparently controlled with great accuracy by certain factors

which have kept it within narrow limits without, however, producing particles of exactly the same length. While the evidence shows the presence of particles of this length in the host, it is unlikely that particles varying so little in length owe their formation to lengthwise aggregation of shorter particles. No union of particles was observed following the storage of purified virus for about one year in distilled water at 1° C.

Blencowe (J. W.) & Caldwell (J.). **A new virus disease of Tomatoes.**—*Nature, Lond.*, clviii, 4003, pp. 96–97, 1946.

A virus disease of tomato plants grown out of doors [in Devon] under commercial conditions in 1944 is considered to be new. Marked symptoms of stunting, and the growth of axillary shoots of bushy appearance in the early stages, were observed. The growing point of the stem may be destroyed, which seems to stimulate proliferation, noticeably also on the main rachis at the bases of individual leaves, after normal 'stopping' and 'disbudding'. Fruits forming on the upper trusses after infection are almost invariably seedless and much smaller than normal fruits. This inhibition of seed formation is interesting from the point of view of the effect of virus diseases on megaspore and microspore formation.

The disease is sap-transmissible and quickly infects tobacco and *Nicotiana glutinosa* systemically, the symptoms in both cases appearing two or three weeks after inoculation. Tobacco shows a green-yellow mosaic with some ring-spotting and *N. glutinosa* necrosis and leaf distortion with a dark green blistering effect. No local lesions were seen on the inoculated leaves. Sap transmission of the disease into tomato occurred less readily than into tobacco and *N. glutinosa* and inoculation experiments with other Solanaceous plants failed. The virus persists in extracted sap for only one or two days at room temperature. Inactivation takes place after 10 minutes' exposure at 50° C. A neighbouring block of chrysanthemums was found to be the source of infection, but the symptoms on these plants were confined to mild stunting and leaf chlorosis.

Observations under experimental and commercial conditions recorded the rapid spread of the disease accompanied by serious loss. It is improbable that the pathogen is transmitted in the course of 'stopping' and 'tying-in' the plants. Further research on the disease is proceeding.

Schussnig (B.). **Eine neue Viruskrankheit der Tomatenpflanzen.** [A new virus disease of Tomato plants.]—*Forschungsdienst*, xvi, 2, pp. 62–84. 2 col. pl., 11 figs., 1943. [Abs. in *Neuheiten PflSch.*, xxxvii, 2, pp. 65–66, 1944. Received March, 1946.]

Tomatoes in south Moravia, Czechoslovakia, sustain heavy quantitative and qualitative damage from a virus disease first recognized by Baudys [*R.A.M.*, xiii, p. 355]. The symptoms include upward curving of the young leaf blades, which are rugose and show a yellow interveinal mottling, subsequently turning purple, downward bending of the petioles, squarrose appearance of the tips of the fruiting axes, stunting and necrosis of the foliage, and streak-like necroses on the petioles, pedicels, and stem axes, culminating in the dark brown discoloration, drooping, and death of the leaves. Typical of primarily infected flowers are virescence, abnormal elongation or arrested development of the sepals, more or less severe dwarfing of the petals, or even complete abortion of the buds. The fruits, however, set normally, the yield is not reduced, and only in severe cases do the seeds fail to germinate.

The symptoms on the fruits are the most distinctive and serve to differentiate the south Moravian tomato virus from any hitherto recognized. On the proximal portion of red-fruited varieties appears a pale ochre to lemon-yellow, green-spotted sector, the whole fruit later becoming mottled or remaining yellow without a tinge

of red. In the case of the yellow-fruited variety Bison the sector is brown. In all varieties the sector hardens though the flesh remains soft. The yellow discoloration is the outward expression of the underlying heavy accumulation of virus proteins through the dense network of the phloem system. The fruit septa and the placentae turn white, so that the affected products are unsuitable for canning, though the flavour is not impaired.

Intensive histological studies confirmed the virus origin of the disease, the fruits being the primary and recurrent focus of infection and the partial extension of the symptoms to the vegetative system a common but not essential sequel.

The virus was artificially transmitted by *Thrips tabaci* from diseased to healthy plants, as well as by means of a pruning knife wetted with inoculum.

The new tomato virus presents analogies with Milbrath's tip blight [a strain of the spotted wilt virus: ibid., xviii, p. 420], but is considered to be a separate entity and assigned the name of *Lycopersicum* virus 7.

Richter (H.). **Achtet auf die Dörrfleckenkrankheit der Tomaten !** [Beware of the Tomato dry spot disease!]—*Blumen- u. PflBau ver. Gartenwelt*, xlvii, 16, pp. 181–183, 4 figs., 1943. [Abs. in *Neuheiten PflSch.*, xxxvii, 2, pp. 50–51, 1944. Received March, 1946.]

An exceptionally severe outbreak on tomatoes of the early-blight phase of *Alternaria solani* is reported from several localities in Germany, the collar-rot symptoms described by American authors [*R.A.M.*, xxii, p. 116] being absent. As in the United States, the damage in the affected areas was computed at 50 per cent. of the crop. Control measures should include the burning of debris in the autumn, disinfection of the stakes, seed treatment, steam or formalin sterilization of the seed-bed, spraying with Bordeaux mixture (beginning on the seedlings), and immersion in the fungicide before transplanting.

Snyder (W. C.), Baker (K. F.), & Hansen (H. N.). **Interpretation of resistance to Fusarium wilt in Tomato.**—*Science*, N.S., ciii, 2685, pp. 707–708, 1946.

Susceptible Bonny Best and largely resistant Pan-America tomato plants were grown in sterilized soil and infected at six weeks by incision of the tap-root under a suspension of *Fusarium oxysporum* f. *lycopersicum* [*F. bulbigenum* var. *lycopersici*]. The subsequent appearance of the fungus in the xylem and its almost equal growth in both varieties up through the root into the aerial stem suggested that there was little antibiotic influence present in the tracheal fluid of Pan-America plants [*R.A.M.*, xxiii, p. 194]. The number of vessels infected in Pan-America was considerably less than in Bonny Best and may explain the slow development of external symptoms in the former variety despite the presence of the fungus and it may be that, under the inoculation technique adopted, only those elements were infected into which the spores were actually drawn, while the multiple infection of the xylem elements in Bonny Best may be due to surface contamination of the lateral roots during inoculation and represent an example of mass fungal action in toxin formation.

Vigorous growth of the fungus *in vivo* in the diseased vascular elements of both varieties appears also to exclude a mobile inhibitor in one of them and the fact of such growth in the xylem of Pan-America suggests that its tolerance is not a property of the whole root system. A physiological explanation of Pan-America's resistance to *F. bulbigenum* var. *lycopersici* may reside in resistance to invasion, or to yellowing and wilting, or both, the first-named concerning the entry of the fungus into the xylem and the second toxin production in the tissue.

Assuming that invasion by the fungus takes place by way of the undifferentiated tissue behind the root-tip, the resistance of Pan-America may indicate a property, of the living cells only of the plant, which appears to prevent fungal penetration

of the lumina of the xylem tubes. It is concluded, therefore, that this resistance to *Fusarium* wilt is a direct function of the cellular protoplasm of Pan-America plants, as in the case of cabbage [ibid., xiv, p. 732].

Diachun (S.) & Valleau (W. D.). **Growth and overwintering of Xanthomonas vesicatoria in association with Wheat roots.**—*Phytopathology*, xxxvi, 4, pp. 277–280, 1946.

Tests were carried out at the Kentucky Agricultural Experiment Station to determine the capacity of *Xanthomonas vesicatoria* [*R.A.M.*, iii, p. 119 *et passim*], *X. phaseoli* var. *sojense*, and *Bacterium* [*Pseudomonas*] *medicaginis* var. *phaseolicola* to grow on wheat, tomato, bean [*Phaseolus vulgaris*], and soy-bean roots and to overwinter in association with wheat roots in a similar manner to *Bact.* [*Pseudomonas*] *tabacum* and *Bact. angulatum* [*P. angulata*: ibid., xxiii, 459, 476]. All three species multiplied and produced colonies on Thorne wheat, Rutgers tomato, Stringless green-pod bean, and Macoupin soy-bean roots, the first-named giving the most consistent results and apparently providing a more suitable substratum for *X. vesicatoria* and *X. phaseoli* var. *sojense* than their own hosts, tomato and soy-bean, respectively.

X. vesicatoria was the only one of the three organisms to be recovered from the roots of wheat sown out of doors in unsterilized soil in November, 1943, isolations being made from December to March, inclusive, but not in April. The tests were made by inoculating water-soaked tomato leaves with aqueous suspensions of macerated root fragments.

These observations would appear to confirm the general impression that the bean halo-blight organism cannot easily overwinter in the soil, if it does so at all, hence the feasibility of control through the use of disease-free seed. On the other hand, *X. vesicatoria*, like the tobacco leaf spots, is evidently perpetuated by other means, probably on the roots of neighbouring plants, and cannot be combated merely by sowing clean seed.

Wager (V. A.). **Blossom-end rot of Tomatoes.**—*Fmg S. Afr.*, xxi, 5, pp. 309–312, 2 figs., 1946.

The use of a surface mulch on the soil of tomato plantations exposed to strong wind in hot, dry weather was found to promote more vigorous growth and to lower the incidence of blossom-end rot [*R.A.M.*, xxiv, p. 209]. The mulch, which can be made with grass, dead leaves, or lawn or hedge clippings, had the effect of lowering the soil tempeature from 113° F. (shade temperature 90°) at soil level to 81° 2 in. below the mulch and did much to redress the balance of water-supply to the plants, which is affected by excessive transpiration in the climatic conditions described. Watering of the plants, preferably by using a sprinkler system, with a view to avoiding alternations of dry and wet days, followed by cultivation, which has the additional advantage of keeping down weeds, also helps to conserve soil moisture. Liberal applications of humus, and of superphosphate where nitrogenous composts or kraal manure are used, and agricultural lime are additional protective measures recommended.

Whitehead (S. B.). **Nutritional deficiencies in Tomatoes.**—*Gdnrs' Chron.*, Ser. 3, cxx, 3109, p. 43, 1946.

The symptoms of nitrogen, potassium, phosphorus, calcium, and magnesium deficiencies in tomatoes [*R.A.M.*, xxii, p. 332; xxiii, p. 461; xxiv, p. 389, and next abstract] are briefly described, the last-named being apparently on the increase in Great Britain. It may be corrected by the application of magnesium sulphate at a dosage of 1 oz. per gal. water per sq. yd. The other deficiencies are also remediable by soil amendments with an appropriate fertilizer, a useful and

well-balanced mixture consisting of two parts each of ammonium sulphate and potassium sulphate and three parts superphosphate, applied at the rate of one to two teaspoonfuls per plant every ten days.

HUNTER (J. G.). **Magnesium chlorosis of Tomatoes.**—*Nature, Lond.*, clviii, 4001, p. 25, 1946.

Heavy applications of magnesium sulphate to the soil as a method of controlling magnesium deficiency in tomatoes [*R.A.M.*, xxv, pp. 15, 291, and preceding abstract] have in the author's experience proved ineffective in south-western Scotland. Experiments at the West of Scotland Agricultural College showed that the absorption of magnesium declined with increasing concentration of the solution in which tomato plants were growing, and when the ratio of potassium to magnesium in it was high, chlorosis was most severe. The conductivity of the soil round chlorotic plants was high and usually higher than that of soil near by in which healthy or less affected plants were growing. Magnesium salts would thus prove harmful where the salt concentration was already dangerously high. Induced chlorosis was associated especially with the use of potassium sulphate as a fertilizer, although it was also caused by over-doses of other potassic fertilizers. The different absorption rates of potassium and sulphate ions may account for these harmful effects. Increasing the sulphate content of the medium at the same soluble salt concentration did not increase the chlorosis.

Early mulching with farmyard manure or peat by promoting secondary root production may help to alleviate the conditions in which induced magnesium deficiency occurs. Where it persists despite very low potash treatments, re-soiling may prove an effective and economic method of control. Repeated spraying with magnesium sulphate gave control but this method is not likely to be practicable in the West of Scotland.

SHANOR (L.). **A previously undescribed fungus causing a leaf spot of Bamboo.**—*Mycologia*, xxxviii, 3, pp. 331–338, 1 pl., 1 fig., 1946.

Infected leaves from the bamboo *Arthrostylidium racemiflorum*, received from El Salvador, on examination at the United States Bureau of Entomology and Plant Quarantine, were found to be harbouring a pycnidial fungus, and ascomata were observed to be developing on further material made available. The organism caused oval, linear, or fusiform spots, not more than 5 mm. long or 2 mm. wide, to appear on the leaves, the tissues becoming necrotic and eventually assuming a yellow-brown colour. The spots were usually scattered but occasionally coalesced. The pycnidial state appeared to precede the ascigerous and was usually the only phase observed on the diseased leaves.

The immersed pycnidial stromata are elongated and contain one to four cavities separated by parenchymatous walls. One conidium develops from each cylindrical conidiophore and abundant conidiophores line the stromatal cavities. Moistening of the mature stromata causes an irregular longitudinal rupture of the wall which facilitates the emergence of the spores. The hyaline, unicellular conidia, with two straight or slightly bent setae, which are attached slightly to the side, one near each end of the spore, are clavate to navicular: they measure up to 16·5 by 5·5 μ, and the setae 12 μ long. It is suggested that the fungus be included in the genus *Ciliochorella* Sydow & Mitter (*Ann. mycol., Berl.*, xxiii, pp. 46–71, 1935), with which it shares generic characteristics.

The perfect state of this fungus has always been found associated with pycnidial stromata, the ascomata, usually less than 1 mm. long, fusiform to allantoid in shape and jet-black, forming a superficial, laterally attached fructification, situated generally near either one or both ends of the stroma. The roof of the ascocarp is convex, consisting of heavily carbonized cells and opens by an irregular, medial,

longitudinal slit. The parenchymatous cells composing the basal plate are carbonized, but not so pronouncedly as the roof tissue. A radial development of the ascomata is clearly observable in young ascocarps and along the margins of older fruiting bodies. The asci are narrowly clavate, short-stalked, hyaline, unicellular, measuring 55 to 69 by 10 to 12 μ, and contain eight ovoid ascospores, pointed at one end, 13·8 to 14·5 by 4·5 μ at the widest point. These features suggest affinity with the Hemisphaeriales as classified by Theissen and Sydow and the fungus may be considered to represent a somewhat eccentric approximation to the Polystomellaceae.

On the basis of this work, a new species, *Ciliochorella bambusarum*, is erected to represent the pycnidial stage of the fungus; and the lateral attachment of ascomata to a pycnidial stroma is held to constitute so characteristic a feature, hitherto undescribed, as to justify setting up a new genus under the designation *Lateropeltis*, with *L. bambusarum* as the type species.

Fischer (H.). **Untersuchungen über Massaria macrospora (Desm.) Sacc., ihre Nebenfruchtform Coryneum macrosporum Berk. und Asterosporium hoffmanni Kze.** [Studies on *Massaria macrospora* (Desm.) Sacc., its imperfect state *Coryneum macrosporum* Berk., and *Asterosporium hoffmanni* Kze.]—*Phytopath. Z.*, xiv, 5, pp. 512–517, 8 figs., 1944. [Received August, 1946.]

Massaria (*Cucurbitaria*) *macrospora*, a weak parasite of the beech in Switzerland, is transferred by the author from the Sphaeriales to the Pseudosphaeriales on the grounds that its 'paraphyses' are united with the stroma covering the ascus layer, in contradistinction to the true paraphyses of the Sphaeriales, which mostly do not project above the asci and in any case are free at the top, according to Gäumann's description [*R.A.M.*, v, p. 683]. Neither on dead beech branches, on the sites of inoculation on beech and *Carpinus betulus*, nor in agar cultures from ascospores of *M. macrospora* or conidia of its imperfect state *Coryneum macrosporum* were pycnidia or pycnospores of *Diplodia faginea* detected, and hence the position of the last-named as a state of *M. macrospora* is regarded as doubtful. No evidence could be found, moreover, of the supposed relationship between *M. macrospora* and *Asterosporium hoffmanni*, which was accepted by Grove [ibid., xvii, p. 68].

Bavendamm (W.). **Valdensia heterodoxa, ein neuer Buchenschädling.** [*Valdensia heterodoxa*, a new Beech parasite.]—*Forstw. Zbl.*, *1944*, 1, pp. 54–60, 3 figs., 1944. [Abs. in *Neuheiten PflSch.*, xxxvii, 3, pp. 86–87, 1944. Received 1946.]

Valdensia heterodoxa, originally described from Italy by Peyronel in 1923 [*R.A.M.*, iii, p. 487], has assumed an epidemic form on young beeches in the Vogtland, Germany, causing a brown discoloration and wilting of the leaves and a gradual die-back of the young shoots. Bilberries [*Vaccinium myrtillus*] were similarly affected. The pathogen evidently thrives only in the interior of relatively sparsely planted stands, and where beeches were free from infection bilberries also remained healthy. Although up to 40 per cent. of the trees were diseased in one 'compartment' [of 50 to 62 acres], the actual damage at the time of writing was not regarded as excessive. The fungus, however, is extending its range, having been reported from Poland, the U.S.S.R., and Latvia, and occurs on 31 hosts.

Fröhlich (J.). **Über den Befall der Fichte in den Ostkarpathen durch Trametes pini.** [On the attack of the Spruce in the eastern Carpathians by *Trametes pini*.]—*Z. ges. Forstw.*, lxix, 4–6, pp. 152–156, 3 figs., 1943. [Abs. in *Neuheiten PflSch.*, xxxvii, 2, p. 47, 1944. Received March, 1946.]

Old spruce trees in mixed stands with beeches and firs [*Abies*] at medium elevations (600 to 1,200 m. above sea-level) in the eastern Carpathians sustain

heavy damage from *Trametes* [*Fomes*] *pini*, the inconspicuous fruit bodies of which are readily overlooked. The fungus completely destroys the heartwood but leaves the sapwood intact, so that the water supply is not immediately interrupted. Only the upper 6 to 10 m. of the relatively low-grade crown wood of diseased spruces 40 to 50 m. in height are fit for manufacturing purposes. The infected trees cannot be saved, but are left standing owing to the high local costs of felling and transport, and they are, moreover, of little use as firewood. Firs appear to be immune from *F. pini* in the region under observation, where they are attacked only by the comparatively innocuous *Aecidium elatinum* [*R.A.M.*, x, p. 361].

[Day (W. R.).] **Forest pathology.**—*Rep. imp. For. Inst., Oxford, 1944–45*, pp. 8–10, 1946.

Further work on the die-back and needle-cast of Corsican pine [*Pinus nigra* var. *calabrica*] in the west and north of England and Wales [*R.A.M.*, xxiv, p. 210] fully confirmed previous conclusions as to the importance of frost in the etiology of the disease. One further case of needle-cast in which *Hypodermella sulcigena* was involved has been reported from the north of England, while the same form of the trouble, often sparing the basal quarter or fifth of the needle, has also been found associated with *Sclerophoma pithyophila* [ibid., xvi, p. 427] in North Wales. Four species of fungi are now known to have occurred on needles with symptoms of the disease, and it is probable that some other factor is primarily responsible for the condition.

A serious die-back of larch observed in Scottish forests was clearly of the same nature as that occurring in England and Wales [ibid., xxiii, p. 200], and here again frost is undoubtedly a predisposing factor in the development of the disease.

Fomes annosus appears to be the agent of a dying-off of 22-year-old Scots and Corsican pines in East Anglian plantations, while a species of *Phytophthora* is indicated as the primary parasite in a similar locally important disorder of Japanese larches [*Larix leptolepis*] in Llantrissant Forest, Wales.

Delevoy (G.). **À propos d'un cas de virulence exceptionelle d'Armillaria mellea (Vahl) Quél.** [On a case of exceptional virulence of *Armillaria mellea* (Vahl) Quél.]—*Bull. Soc. for. Belg.*, liii, 4, pp. 104–114, 1946.

In 1926–7 a plantation of spruces at Offagne, Belgium, which had already been partly cleared owing to infection by *Septoria parasitica* and where the remaining trees showed severe attack by *Fomes annosus*, was cut down and replanted in 1931–2 with Japanese larch (*Larix leptolepis*). In 1933 the larches began to die off, and by 1941 three-quarters of them had been replaced by birches and oaks. The remaining larches, except for a few healthy ones, died off in turn, withering up suddenly, after showing exudations of resin on the trunks and branches. In 1934–5, when the rest of the plantation was cut down, the stumps were removed.

Groups of Japanese larches were planted in parts previously uninfected but 20 per cent. were lost in under ten years. On the other side of a path on healthy land, spruces were planted in 1936, since when single individuals and small groups have turned yellow and suddenly withered and died.

All these losses appeared to be due to *Armillaria mellea* [*R.A.M.*, xxiv, p. 257], the mycelium of which was found in the affected trees. There were no factors to which this exceptional virulence of *A. mellea* could be attributed. Resinous exudations were observed at the foot of the trees, but they were not copious. Bark swelling was not conspicuous and was seldom present at a height of more than 60 cm. from the ground. The trees, however, had reacted strongly; resin was present along the entire length of the trunks, and the branches showed numerous resin droplets exuded from cavities present in the bark, where there was no mycelium. Larches 15 years old and 5 to 6 m. high showed marked enlarge-

ment of the resiniferous canals of the bark, which outwardly resembled small pustules.

White (W. H.) & Doolittle (S. P.). **A vegetable gardener's handbook on insects and diseases.**—*Misc. Publ. U.S. Dep. Agric.* 605, 30 pp., 10 figs., 1946.

The principal pests and diseases of vegetable-garden crops are listed under their several hosts (arranged in alphabetical order of the common names), with brief descriptions, notes, and directions for control. A concluding section deals with general methods of control and includes a number of standard formulae and other useful information connected with spraying and dusting operations.

Lamprecht (H.) & Hertzman (N.). **Immuna II, ny mot klumprotsjuka mycket motståndskraftig stam av Rova.** [Immuna II, a new strain of Swede highly resistant to club root.]—*Agri. Hort. Genet.*, i, 1–2, pp. 31–33, 1 fig., 1943. [German and English summaries.]

Immuna II, strain No. 26, is a swede developed at the Weibullsholm Plant Breeding Institute, Landskrona, Sweden, from the cross (Marienlyst V × Red-headed Bortfelder) × Immuna, which combines a high degree of resistance to club root [*Plasmodiophora brassicae*: *R.A.M.*, xx, p. 439] with heavy cropping.

Ledingham (R. J.). **The effect of seed treatment and dates of seeding on the emergence and yield of Peas.**—*Sci. Agric.*, xxvi, 6, pp. 248–257, 1 graph, 1946.

Tests from 1943 to 1945 at Saskatoon, Saskatchewan, where peas are not grown commercially and little information on their disorders is available to domestic cultivators, showed that emergence of pea seed treated with dust fungicides was best in early-sown varieties and deteriorated with later plantings, and in the main the results agreed with past experience in England and America, viz., the value of seed treatments is largely dependent on seed and environmental conditions. Progressive decreases in emergence in Saskatchewan after the excellent results of the earliest plantings could not be attributed to changes in soil moisture or to rain shortly after planting. Temperature rose more or less regularly as the season advanced, but its relationship to emergence is not simple [cf. *R.A.M.*, xxiii, p. 511]. There may be a delicate adjustment between soil temperature and the causal pathogens of pre-emergence blight (*Pythium ultimum* and other species), the data showing a sharp fall between the first and second sowings, during which the temperature was relatively stable. The reason may lie in the delay of *P. ultimum* and other pre-emergence pathogens to become active before late spring, by which time the primary plantings have outlived the susceptible stage. The results of his experiments lead the author to conclude that soil temperature must be regarded as a determining factor in the emergence of garden peas. Smooth-seeded field peas appeared to be more favoured by higher temperatures than garden peas during their germination period.

All the treatments tested proved effective, with possibly some advantage in the case of the mercurial dusts, ceresan and semesan.

Reid (W. D.). **Resistance of Beans to halo-blight and anthracnose and the occurrence of Bean-mosaic and Bean-weevil.**—*N.Z.J. Sci. Tech.*, A, xxvii, 4, pp. 331–335, 1 fig., 1945.

None of the 72 bean (*Phaseolus vulgaris*) varieties, comprising 137 dwarf and runner lines, tested for resistance to halo blight (*Pseudomonas medicaginis*) and anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xxv, p. 199] in 1943–4 and 1944–5 was immune from both diseases, though all the white-seeded and runner varieties were highly resistant, as also were Golden Wax, Pink, Pinto, Tennessee, Red Mexican, and Red Valentine. The Pink, Zebra, and Oregon Giant varieties

developed no halo blight, while Small White, Burbank, and Ideal Market were free from anthracnose. Of eight varieties attacked by the bean-mosaic virus, only two were derived from seed used in the previous series of trials.

Dean (L. L.) & Hungerford (C. W.). **A new Bean mosaic in Idaho.**—*Phytopathology*, xxxvi, 4, pp. 324–326, 1946.

A new strain of the common bean [*Phaseolus vulgaris*] mosaic virus characterized by its pathogenicity to the ordinarily resistant Great Northern U.I. 15 variety was observed in Idaho in 1943 and shown by inoculation experiments on local seed and that of the same varieties used by Richards and Burkholder in their studies on a similar disease in New York [*R.A.M.*, xxiii, p. 207] to be identical with the latter. The University of Idaho Red Mexican selections 3 and 34, as well as Pinto and several of its derivatives, are susceptible to the new strain but resistant to the common bean-mosaic virus, Great Northern U.I. 1, 56, 59, 81, and 123 are resistant to both, Michelite, Robust, Red Kidney, Bountiful, and Burtner are susceptible to the new strain, and Idaho Refugee and U.S. No. 5 resistant.

Kišpatić (J.). **Einleitende Versuche über Rassenbildung bei Uromyces fabae (Pers.) de Bary.** [Introductory experiments on race formation in *Uromyces fabae* (Pers.) de Bary.]—*Phytopath. Z.*, xiv, 5, pp. 475–483, 5 figs., 1944. [Received August, 1946.]

From three collections of *Uromyces fabae* from Germany 16 monospore lines were isolated and tested on 14 commercial broad bean varieties, of which seven showed an appreciable degree of resistance, viz., Butjadinger Ackerbohne, Füllbergs Hochzucht Feldbohne, Dr. Francks Hohenloher Ackerbohne, Rosenhofer Feldbohne, Herz Freya Ackerbohne, and Rastatter Ackerbohne Stamm 1 and Stamm 8, while two were highly susceptible, Breustedts Schladener Kleine Feldbohne and Strubes Schlanstedter Ackerbohne. The outcome of these preliminary tests is considered to point to the existence of physiologic races of the rust [cf. *R.A.M.*, xiii, p. 670].

Allington (W. B.). **Bud blight of Soybean caused by the Tobacco ring-spot virus.**—*Phytopathology*, xxxvi, 4, pp. 319–321, 2 figs., 1946.

The reduction in the 1943 and 1944 soy-bean crops in the mid-western States of the American Union caused by the tobacco ring-spot virus [*R.A.M.*, xxiv, p. 133] exceeded all previous records. In addition to the symptoms already noted for Illinois, mention may be made of the unusual prominence and darkening of the pubescence on the young stem tip, necrosis and brittleness of the growing point, occasional streaking of the petioles and large leaf veins, and (in the case of late infection) dark blotching of the pods, sometimes followed by the shrivelling and dropping of a high percentage of young clusters within ten days of the attack.

The soy-bean virus produced typical ring-spot symptoms on tobacco, and the effects of inoculation with the strains from both these hosts on Red Kidney beans (*Phaseolus vulgaris*) and cucumber were indistinguishable, the resultant severe stunting and mottling persisting indefinitely. The thermal inactivation point of the soy-bean virus corresponded precisely with that of tobacco ring-spot, viz., 65° C. (ten minutes' exposure). The rapid spread of the disease through the soy-bean fields is probably due to insect agency.

Smith (F. G.), Walker (J. C.), & Hooker (W. J.). **Effect of hydrogen-ion concentration on the toxicity to Colletotrichum circinans (Berk.) Vogl. of some carboxylic acids, phenols, and crucifer extracts.**—*Amer. J. Bot.*, xxxiii, 5, pp. 351–356, 3 graphs, 1946.

This biochemical examination of crucifer tissues to determine the nature of resistance to club root (*Plasmodiophora brassicae*) includes an examination of their toxicity to spores of *Colletotrichum circinans* [*R.A.M.*, xxv, p. 380] and a com-

parison of this toxicity with that of typical phenols and carboxylic acids. The results show that the pathogenicity of ether-soluble, strong acid fractions of crucifer extracts was correlated with pH. The carboxylic acids exhibited almost parallel linear curves, the decreasing order of toxicity being benzoic, protocatechuic, and acetic acids. Hydroquinone and catechol were markedly different from the acids, the toxicity of the former notably increasing at pH 7, and a comparison with that of the corresponding P-quinone suggests that autoxidation to quinone had occurred. The curves for crucifer extracts suggest that carboxylic acids or similar toxicants are mainly responsible for toxicity. Two possible mechanisms are suggested by these experiments whereby relatively small variations in pH may bring about marked modifications in fungicidal activity important in natural disease resistance or in the application of commercial fungicides.

Ramsey (G. B.), Heiberg (Barbara C.), & Wiant (J. S.). **Diplodia rot of Onions.** —*Phytopathology*, xxxvi, 4, pp. 245–251, 3 figs., 1946.

Texas-grown, white-skinned Crystal Wax onions were observed for the first time on the Chicago market in 1938 to be infected by *Diplodia natalensis* [*R.A.M.*, xix, p. 110], causing a silvery-grey discoloration of the outer dry scales round the upper half of the bulbs or occasionally all over them, while the necrotic portions of the outer fleshy scales were also often invaded, becoming black and leathery. In no case, however, was involvement of the internal fleshy scales detected.

The onion isolate of the fungus, which produced on potato dextrose agar pycnospores ranging from 20 to 28·4 by 10·2 to 17·7 (average 23·6 by 12·8) μ, was compared with 12 others from six hosts, namely, avocado, coco-nut, orange, groundnut, sweet potato, and watermelon: no essential differences necessitating specific separation were found. Cross-inoculation experiments with the onion strain gave positive results on sweet potato, apple, and orange, thereby confirming the conclusions of other workers as to the morphological and symptomatological similarity of *Diplodia* isolates from a wide variety of hosts [ibid., xx, p. 278 *et passim*]. The minimum, optimum, and maximum temperatures for the growth of the onion isolate in pure culture were 50°, 85°, and 104° F., respectively.

A chemical, probably protocatechuic acid, associated with the pigments in aqueous extracts of the dry outer scales of coloured varieties (which are not affected by the rot) proved toxic to the spores of *D. natalensis* from white onions [cf. ibid., ix, p. 284; xxv, p. 380]. The amounts of this substance in white onion scabs are insufficient to prevent the germination of spores of the pathogen. Little difference was found between the coloured and white varieties in respect of the acidity of the dry and fleshy scales (pH 4·4 to 4·5 and 5·7 to 5·9, respectively), and the fungus made good growth within these ranges, showing that the hydrogen-ion concentration of the tissues is not the primary factor in restricting pathogenicity to white-skinned onions.

These studies, supplemented by market observations during the past seven years, indicate that *D. natalensis*, though not actively parasitic on white onions, may considerably reduce the commercial value of the southern crop.

Brierley (P.) & Smith (F. F.). **Reaction of Onion varieties to yellow dwarf virus and to three similar viruses isolated from Shallot, Garlic, and Narcissus.**— *Phytopathology*, xxxvi, 4, pp. 292–296, 1946.

Of 27 onion varieties mechanically inoculated with the onion yellow-dwarf virus [see next abstract] and related isolates from shallot (Louisiana) [cf. *R.A.M.*, xxiv, p. 135], garlic (Oregon), and narcissus [daffodil] (*Narcissus*) [*pseudonarcissus*] King Alfred variety (material supplied by F. A. Haasis), ten were immune from the yellow-dwarf, garlic, and daffodil viruses, viz., Early Yellow Babosa, White Babosa, Utah Sweet Spanish, Yellow Sweet Spanish, Crystal Wax, Lord Howe Island, San

Joaquin, Yellow Bermuda, Nebuka (*Allium fistulosum*), and a Beltsville amphidiploid, Nebuka × White Portugal, and 17 susceptible. The shallot virus, on the other hand, was pathogenic to every variety except Nebuka and the above-mentioned amphidiploid, these two green-bunching types thus being immune from the four viruses under observation, all of which proved to be transmissible by *Myzus persicae*.

Brierley (P.) & Stuart (N. W.). **Influence of nitrogen nutrition on susceptibility of Onions to yellow-dwarf virus.**—*Phytopathology*, xxxvi, 4, pp. 297–301, 1 fig., 1946.

In 1944–5 four onion varieties, Ebenezer, Utah Sweet Spanish, Creole, and Stockton Yellow Globe, grown at high (60 p.p.m.) and low (6 p.p.m.) weekly initial nitrogen levels in 'haydite', were inoculated with the yellow-dwarf virus [see preceding abstract] from naturally infected multiplier onion (*Allium cepa* var. *solaninum*) from West Virginia [*R.A.M.*, xxiii, p. 469]. The percentages both of symptom expression and actual infection were smaller, in a highly significant degree, at the lower nitrogen level. The recognized immunity of Utah Sweet Spanish was unimpaired by 17 inoculations between 24th October and 17th April at the high nitrogen level, which on the other hand increased the incidence of infection both in the highly susceptible Ebenezer and the fairly resistant Creole and Stockton Yellow Globe. Thus, the incidence of yellow dwarf in Ebenezer had risen from 94·3 per cent. at the first count on 14th November to 100 at the third on 23rd January, the corresponding figures for Stockton Yellow Globe, Creole, and Utah Sweet Spanish being from 30·3, 18·2, and 0 to 93·1, 83·8, and 0, respectively, at the eighth count on 11th June.

Yarwood (C. E.). **Isolation of Thielaviopsis basicola from soil by means of Carrot disks.**—*Mycologia*, xxxviii, 3, pp. 346–348, 1946.

The high susceptibility of carrot has encouraged the author to attempt to isolate *Sclerotinia sclerotiorum* from soils and plant debris by means of a living carrot disk technique. Very few isolations of *S. sclerotiorum* were secured, but in 66 out of 240 tests *Thielaviopsis basicola* was freely obtained from several soils in the San Francisco Bay and Santa Clara Valley areas, and notably from an ornamental garden in Berkeley and an apricot orchard near Hollister.

Soils from field collections were spread over carrot root disks 5 mm. thick in Petri dishes, enough water being added by atomizing to moisten the soil without allowing the formation of free water. After two to four days at room temperature the disks were washed free of soil and incubated in moist chambers. When soils containing *T. basicola* were used as inoculum, greyish colonies appeared about six days later. Primary formations of endoconidial colonies turned almost black to form prolific macroconidial populations, and pure cultures of *T. basicola* followed transfers from the aerial mycelium to potato dextrose agar. The disks showed no apparent discoloration or decay until ten days after inoculation, and the mycelium was microscopically observed to have invaded the areas between and within the cells without disintegrating them until penetration was far advanced. When dilute spore suspensions from pure cultures were employed and the carrot disks were, in consequence, not washed following inoculation, colonies could be counted in three days. In none of the areas from which soil samples were drawn was the fungus observed as parasitic on crops.

Pryor (D. E.). **Exploratory experiments with the big-vein disease of Lettuce.**—*Phytopathology*, xxxvi, 4, pp. 264–272, 1946.

Experiments involving three species of leaf-feeding aphids, *Macrosiphum solanifolii*, *Myzus convolvuli*, and *M. persicae*, various methods of mechanical inoculation,

lettuce seed soaked in diseased leaf juice, and seed harvested from infected plants, gave inconsistent results in respect of big-vein [*R.A.M.*, xxiv, p. 135] transmission. The addition of unfiltered lixiviate from infective soil to disease-free soil induced big vein in 4 out of 83 plants grown thereon, whereas the filtered lixiviate was innocuous. Leaching failed to eliminate the virus from the soil. In two tests big vein developed in plants grown on soil to which chopped diseased leaves were added, 5 out of 48 being affected in the first and 5 out of 40 in the second, while all in the control plots remained healthy.

There was little difference in the incidence of big vein developing in transplants and in lettuce sown directly in infective soil. Trials in which one diseased plant was grown for 2 to $2\frac{1}{2}$ months adjacent to three healthy plants in a 6-in. pot filled with non-infective soil indicated that the virus travelled very slowly, if at all, through the undisturbed soil during that time. Transplanting lettuce at intervals from infective to non-infective soil showed that some big vein develops within a fortnight of sowing, but under the experimental conditions at least four weeks' growth in infective soil was necessary to induce symptoms in a high proportion of the plants. In exploratory tests the dilution of 1 part of big-vein soil with 800 of autoclaved soil only slightly reduced the incidence of infection. Stored, air-dry soil has been found to retain its virulence for at least eight years.

A soil temperature of 22° C. was most conducive to the development of big vein in five out of seven tests, the optima in the other two being 26° and 18°; some infection occurred throughout the range from 14° to 30°. Air temperatures, however, also appear to be concerned to some extent in the expression of big-vein symptoms, and further studies are required to elucidate their effects, both independently of, and combined with, those of soil temperatures.

Săvulescu (T.). **Rumania. Downy mildew of the Vine during 1940.**—*Int. Bull. Pl. Prot.*, xv, 7–8, pp. 134 M–141 M, 1941. [Received July, 1946.]

Owing to the prevailing weather conditions, downy mildew of the vine (*Plasmopara viticola*) was very severe in Rumania in 1940; in many parts of the country the harvest was entirely lost. Infection developed not merely on the leaves and bunches, but on the tendrils and young shoots, the growth of which was stunted.

Depardon (L.). **Les hybrides producteurs directs dans la région du Centre.** [Ungrafted Vine hybrids in the central district.]—*C.R. Acad. Agric. Fr.*, xxvii, 12, pp. 670–678, 1941. [Received August, 1946.]

In these notes on the ungrafted vine hybrids cultivated in central France it is stated that Seibel 5.455 shows good resistance to mildew [*Plasmopara viticola*] and fair resistance to court-noué. Seibel 8.365 is one of the most resistant to *P. viticola*. Seibel 8.357 is very resistant to *P. viticola* and appears to be resistant to court-noué. Seyne-Villard 12.426 seems to be virtually immune from *P. viticola*. Among white hybrids, Seibel 4.986 and 11.803 rosé are very resistant to *P. viticola*, while Seyne-Villard 5–276 is completely resistant. Seibel 10.173 shows resistance of the fruit berries to rot, but its leaves are rather susceptible to mildew.

Arnaud (G.). **Traitement du mildiou de la Vigne. Aspect actuel de la question.** [The treatment of Vine mildew. The present state of the question.] —*C.R. Acad. Agric. Fr.*, xxvi, 21, pp. 716–721, 1940. [Received August, 1946.]

After pointing out that economies in the use of copper against vine mildew [*Plasmopara viticola*] are to be sought mainly in improving the methods of application, and only secondarily amongst suitable substitutes for copper, the author states that Bordeaux and Burgundy mixtures are, on the whole, irreplaceable as regards cost and effectiveness, but certain cupric products can be used to supple-

ment them. Application of copper mixtures (especially Bordeaux mixture) can be improved by a more judicious selection of the dates of spraying and by adopting a more effective spraying technique. The fixed spray-jets involve a loss of one-third or one-half of the spray fluid, which could be obviated by using jets on flexible tubes held in the hands. There is no substitute for Bordeaux and Burgundy mixtures at present, but nickel and possibly cobalt appear to be effective against *P. viticola*. Vine-growers should never be advised to reduce the amount of copper used unless it is certain that the alternative suggested will prove successful.

DUBAQUIÉ. **Essais de traitement contre le mildiou par l'ammoniure de cuivre. Bordeaux 1941.** [Trials of treatment against mildew with cuprammonia. Bordeaux 1941.]—*C.R. Acad. Agric. Fr.*, xxvii, 6, pp. 900–902, 1941. [Received August, 1946.]

In tests of cuprammonia against vine mildew [*Plasmopara viticola*] carried out by the Abbé Dubaquié on an area of 150 ha. in the vicinity of Bordeaux the undiluted material ('ammoniure cellulosique': mean content, 15 to 20 gm. copper and an equal weight of cellulose per l.) for the spray was handed to the growers, who added a sufficient quantity of the water used by them for general purposes to make a solution containing 25 gm. copper per hl. Each grower used the spray to replace one or more treatments with Bordeaux mixture (1½ or 2 per cent.), so that on every occasion when the substitution was made there was an economy in copper of 15 or 20 to 1. No directions were given as to spraying.

The results obtained were as follows. The vines treated once or more with cuprammonia and given a final application of Bordeaux mixture in August gave a crop as free from infection as that obtained from the vines treated throughout with Bordeaux mixture, the crop was equally good, and the foliage and wood were slightly better. The vines treated exclusively with cuprammonia gave a crop as free from mildew as that given by any other treatments, but when the cuprammonia was applied after 10th August during rainy weather, leaf scorch resulted, sometimes followed by premature fruit-drop. Further work was arranged to study the question of these late applications. The author recommends that the preparation of cuprammonia should be undertaken on a large scale immediately. [In commenting on this paper, G. BERTRAND discusses (pp. 902–904) problems of control requiring further study.]

BARRAUD (Mlle M.). **Le mildiou de la Vigne. Essais du 1er degré à La Grande Ferrade. (Rapport sur les travaux effectués et les résultats obtenus en 1943.)** [Vine mildew. First-degree trials at La Grande Ferrade. (Report on work done and results obtained in 1943.)]—*Ann. Épiphyt.*, N.S., xi, 1–2, pp. 105–114, 1945.

During 1943, infection by vine mildew [*Plasmopara viticola*] was very light at La Grande Ferrade, affecting only the leaves. Spraying and dusting trials with 15 different materials applied at dates recommended by the local spray-warning service showed again that products containing copper gave the best results, Bordeaux mixture at 1 and 0·4 per cent. and copper oxychloride at 250 gm. per hl. affording satisfactory protection to the foliage, which was still virtually unaffected as late as 25th October.

GAUDINEAU (Mlle M.) & BARRAUD (Mlle M.). **Années à faible mildiou et traitements des Vignes.** [Years of slight mildew and Vine treatments.]—Reprinted from *C.R. Acad. Agric. France*, ccxxii, 9th January, 3 pp., 1946.

In 1944 and 1945, weather conditions were unfavourable in France to attacks of vine mildew [*Plasmopara viticola*]. In the former year, Bordeaux mixture 4 and

2 per cent. gave slightly better results than at 1 per cent., in 1945 concentrations of 1 and 2 per cent. were about equally effective. Only one spray application was made in 1944, on 18th July, and materials low in copper, such as product W (an organic material containing 2·5 per cent. copper) did not protect the leaves against infection in August, but in 1945, when treatments were made on 4th July and 7th August, their effect was adequate. Spraying promoted the retention of leaves until October, those on untreated vines falling in early or mid-September, the Bordeaux mixtures being most effective in this respect.

That early copper treatments are advisable even when conditions do not favour *P. viticola* is indicated by the fact that black rot [*Guignardia bidwellii*] has become increasingly prevalent since 1942 and has reappeared in south-western France, where it had previously been kept in check for 40 years by regular treatments against mildew. In years of slight infection, therefore, when no treatment is needed before the berries ripen a spray of a low copper concentration should be applied early in August to preserve the foliage, help the ripening of the wood, and prevent any recrudescence of the disease.

Lafon (J.). **Expérimentation en serre de produits contre le mildiou de la Vigne.** [Greenhouse tests of products against Vine mildew.]—*Rev. Vitic., Paris*, xcii, 6, pp. 174–176, 2 figs., 1946.

The author describes a greenhouse method for the preliminary testing of materials intended for use against vine mildew (*Plasmopara viticola*). Winter spores on fragments of leaves were germinated at 25° C. When the conidia appeared, young leaves of potted vine cuttings were inoculated by the usual methods to provide inoculum. The test cuttings were sprayed individually on both leaf surfaces with the various test materials. Next day the upper and lower leaf surfaces and the whole cutting were sprayed with double-distilled water containing numerous conidia. Each potted cutting was then kept under very moist conditions so that an adequate humidity was maintained for infection to take place and to facilitate the development of the conidiophores.

All inoculations so made gave positive results in spring, summer, and autumn, the untreated controls and plants sprayed with ineffective materials becoming entirely covered with mildew, conidiophores developing even on the herbaceous stems, the petioles, and along the veins on the upper surface of the leaves.

This method is useful for the rapid elimination of materials found to be unsatisfactory. Promising materials can then be tested under field conditions.

Pastac (J. A.). **La bouillie bordelaise a-t-elle trouvé un remplaçant?** [Has Bordeaux mixture been displaced?]—*Rev. Vitic., Paris*, xcii, 3, pp. 72–75; 4, pp. 107–111, 1946.

Discussing the chemical nature of materials likely to be of use against vine diseases, the author states that copper salts are unable to arrest the mycelium of *Oidium* [*Uncinula necator*], but they can inhibit the zoospores and young mycelium of mildew [*Plasmopara viticola*]. Owing to the absorbing power of the mildew plasma very small quantities of copper salts in solution are sufficient to prevent infection [by *P. viticola*]. The exceptional position which copper fungicides occupy to-day among even stronger antiseptics (formalin, malachite green, etc.) is attributable to their stability, adhesive powers, and resistance to meteorological factors. Their action is lasting and every fresh attack by mildew meets traces of copper products on treated plants.

The author reviews the stability and means of stabilizing dyes (since their fungicidal value depends on this), the known antiseptic action of malachite green, the effect of copper salts as compared with that of organic dyes, the dosages of fungicidal dyestuffs, and the materials which might replace Bordeaux mixture.

Such a material should be stable, adhesive, and only slightly soluble, properties which may be conferred upon basic dyes by chemical treatment.

The 2,4-dinitrocresol used as a winter treatment for fruit trees and vines, when applied to vines in summer, burns the foliage, particularly the infected areas, and this indicates that at a lower concentration it might be useful against mildew.

Barraud (Mlle M.) & Gaudineau (Mlle M.). **Oidium de la Vigne. Essais de traitements en 1944.** [Vine *Oidium*. Experimental treatments in 1944.]—*Ann. Épiphyt.*, N.S., xi, 1–2, pp. 121–138, 1945.

During 1944, when attacks by vine *Oidium* [*Uncinula necator*] were severe locally, spraying and dusting trials carried out at La Grande Ferrade on the Cabernet-Sauvignon Muscadelle and Malbec varieties showed that the best results were given by sublimated sulphur. This material should always be applied to the foci of infection at the renewal of growth when a severe outbreak threatens. Natural ores enriched by the addition of pure sulphur increased in effectiveness with increasing sulphur content, that containing 30 per cent. sulphur giving good results. The waste product from coal gas, containing about 18 per cent. sulphur, was rather better than sulphur ore enriched to 20 per cent., and sometimes equalled that with a 30 per cent. sulphur content. Sulphosodium mixture (250 gm. sulphur per l., used at 1 per cent.) was extremely effective. Lime-sulphur (230 gm. sulphur per l., used at 2 per cent.) might be useful when sulphur is unobtainable or in cool weather. If colloidal sulphur is used (85 per cent. sulphur) it must be applied at a rate of over 250 gm. per hl. Wetters containing terpenic alcohols [*R.A.M.*, xviii, p. 17] added to Bordeaux mixture 2 or even 1 per cent. gave promising results, and this mixture is recommended for the fruit bunches instead of Bordeaux with potassium permanganate, which is useless unless followed by a sulphur treatment.

Curran (M.). **Action anti-Oidium des mouillants à base d'alcools terpéniques.** [The anti-*Oidium* action of wetters containing terpenic alcohols.]—*Rev. Vitic., Paris*, xcii, 3, pp. 84–86; 5, pp. 143–145; 6, pp. 169–173; 5 figs., 11 graphs, 1946.

The author's laboratory investigations [which are described in detail] show that the fungicidal power *in vitro* against spores of *Uncinula necator* of wetters containing sulphonated terpenic alcohols [see preceding abstract] is greater than that of lime and distinctly superior to that of copper sulphate. All the conidia submerged in a 0·3 per cent. solution were killed in two hours, the numbers surviving in copper sulphate solution (1 per cent.) and lime water (saturated) after the same period being 28 and 18 per cent., respectively. In nature, however, copper, like lime, has the advantage of not evaporating, and it may possess towards the conidia of *U. necator* the same power of inhibiting germination that it shows towards the spores of downy mildew [*Plasmopara viticola*]. The anti-*Oidium* power of Bordeaux mixtures with a wetter containing terpenic alcohol is attributed to the complete and homogeneous spread of the copper and lime over the plant so that the fungus cannot find a place favourable for development. The terpenic alcohols (even if they do not possess all the qualities necessary to provide by themselves an effective treatment) are considered to play an active and an individual part against *Oidium*. When terpenic alcohols are used in preparations that are chemically well balanced and under conditions that allow them to contact the fungus for a sufficiently long period, they bring about the death of *U. necator* spores, firstly by surrounding them with an insulating layer which asphyxiates them, and, secondly, they are able either to dissolve certain elements in the plasma membrane or to penetrate and rupture it, so bringing the cytoplasm fairly rapidly into contact with fungicidal materials. Of these two processes the second, owing to the rapidity and intensity of its effects, is mainly responsible for the anti-*Oidium* action of the terpenic

alcohols, but it appears that the wetter should be in a state of emulsion; this does not last long, being related to the period of evaporation of the water. Afterwards, only the insulating capacity is effective and then only for a certain time.

In one field trial on vegetable marrow suffering from *Oidium* [*Erysiphe cichoracearum*], using terpenic alcohol wetter (at 3 parts per 1,000), dissolved either in distilled water or in lime water (5 per cent.), the number of living conidia on the leaves was reduced from between 50 and 59 to 11 per cent.

Limasset (P.). **Les maladies à virus des plantes et le problème du court-noué.** [Virus diseases of plants and the problem of court-noué.]—*Rev. Vitic., Paris*, xcii, 5, pp. 134–139, 1946.

After briefly reviewing the characteristics of plant virus diseases in general, the author discusses with particular reference to the views of Branas [*R.A.M.*, xix, pp. 66] the question of the possible virus nature of court-noué of the vine [see also ibid., xxii, p. 195]. He concludes that the hypothesis that the disease is of virus origin is supported by two arguments, that it is graft-transmissible and that in its symptoms it resembles certain virus diseases. That the disease assumed epidemic proportions only after the French vineyards had been invaded by *Phylloxera* [*vastatrix f. radicicola*] supports the view that court-noué may be transmitted by this insect. The other arguments brought forward by Branas in support of this view are regarded as untenable until supported by extensive experiments. While the author admits that there is a form of court-noué which is transmissible by grafting and produced by one or several viruses, he does not imply that *Pumilus medullae* [ibid., xxii, p. 196] plays no part in the disease. The probability in favour of a virus origin is particularly strong in the case of 'jaunisse' [yellowing: ibid., xvi, p. 18].

In relation to court-noué, official control of vine nurseries cannot be too strict. As a precautionary measure such nurseries should be established only in areas free from *Phylloxera*.

Tardivo (P.). **Une opinion sur les causes du court-noué.** [An opinion on the causes of court-noué.]—*Rev. Vitic., Paris*, xcii, 5, p. 146, 1946.

The author puts forward the view that the physiological type of court-noué disease of the vine [see preceding abstract] may in some instances be due to or favoured by unsuitable cultural practices and unbalanced soil conditions, including improper drainage and insufficient application of organic manure, even on good soils.

Wilhelm (A. F.). **Untersuchungen zur Frage einer chemischen Bekämpfung der Traubenfäule (Botrytis cinerea).** [Studies on the question of chemical control of Grape rot (*Botrytis cinerea*).]—*Wein u. Rebe*, xxvi, 4–6, pp. 29–49; 7–9, pp. 67–73, 3 figs., 1944. [Abs. in *Neuheiten PflSch.*, xxxvii, 5, p. 168, 1944. Received March, 1946.]

Bordeaux mixture, with and without soap, adhesives, and wetters, and a number of other proprietary preparations, did not give effective control of grape rot (*Botrytis cinerea*) in the author's experiments. The thermal death point of the conidia was found to be 44° C. When germinated in water the conidia were unable to infect unwounded vine leaves and grapes, but those in a nutrient medium penetrated the uninjured tissues. Wounded leaves and grapes were infected without the aid of nutriment. *B. cinerea*, therefore, is a wound parasite, not a facultative one. Bordeaux mixture completely fails to protect injured fruits because the toxic element in the copper is eliminated by the natural germination medium of the conidia, but it does reduce the incidence of infection on unwounded grapes.

The action of soap and various new adhesives and wetters is purely supplementary. A new line of approach to the problem should be sought, substituting organic compounds for metals.

Doncaster (J. P.) & Kassanis (B.). **The Shallot aphis, Myzus ascalonicus Doncaster, and its behaviour as a vector of plant viruses.**—*Ann. appl. Biol.*, xxxiii, 1, pp. 66–68, 1 pl., 1946.

A new species of aphid, *Myzus ascalonicus* Doncaster, found on shallots in storage, on onions, and on other plants in glasshouses and in the field between October and June, is described and compared with *M. persicae* Sulz., to which it bears a superficial resemblance. *M. ascalonicus* was found to transmit dandelion yellow mosaic virus [*R.A.M.*, xxiii, p. 372], of which *M. persicae* is not a vector, and also cucumber virus 1 [cucumber mosaic virus], *Hyoscyamus* virus III [henbane mosaic virus], and sugar beet yellows virus [beet yellows virus], all of which are transmitted by *M. persicae*. Potato virus Y, severe etch [tobacco etch virus], lettuce mosaic, and sugar beet mosaic are transmitted by *M. persicae*, but not by *M. ascalonicus*.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1940.** [Review of phytopathological records noted in 1940.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 1, pp. 1–56, 1941. [Received June, 1946.]

This report [cf. *R.A.M.*, xix, p. 68] contains numerous items of phytopathological interest, of which only a few can be mentioned here. Against vine mildew (*Plasmopara viticola*), severe outbreaks of which occurred, Casale's mixture [ibid., xxii, p. 52], prepared as a powder to which water is added when required, was outstanding; the results given equalled those obtained from ordinary Bordeaux and Burgundy mixtures, though the season was very rainy. Reports from Trieste stated that the vine disease due to *Phomopsis viticola* [ibid., xvii, p. 288] was spreading.

An entire olive plantation extending over about 40 ha. in Reggio Calabria was attacked by root rot (*Armillaria mellea*). Three five-year-old Precoce argenté peach trees imported from France developed a wilt due to mosaic [ibid., xxii, p. 439], not previously recorded on this host in Italy. All attempts to find *Phoma limoni* [ibid., xxv, p. 445] in Sicily during the spring and summer were unavailing; it was discovered in Liguria, but was very uncommon. The author is convinced that this species, which appears to be purely saprophytic, is confined in Italy to the north, where it occurs on ornamental lemons already damaged by some other cause. *P. limoni* is certainly not synonymous with *Deuterophoma tracheiphila*.

Wheat yields were reduced by unfavourable weather conditions and infection by *Erysiphe graminis*. The first uredosori of *Puccinia glumarum* were collected in the middle of May at Maccarese. Mentana wheat leaves affected by *P. triticina* and *P. graminis* were received in February from Gondar [Abyssinia]. In Friuli wheat was widely attacked by *Fusarium graminearum* [*Gibberella zeae*]. *Cladosporium herbarum* and *Alternaria tenuis* were commonly present on wheat in northern Italy and also in the province of Cagliari. Maize showing leaf spot due to *Helminthosporium turcicum* was received from the vicinity of Trieste; the varieties chiefly attacked were Marano Vicentino and de Wolff, grown in various parts of Friuli. Numerous specimens of maize leaves attacked by *P. maydis* were received from Umbria.

Beans (*Phaseolus vulgaris*) in Maccarese were severely attacked during two successive years by *Colletotrichum lindemuthianum*. Dutch and Lithuanian flax varieties showed very severe collar and root rot due to *Phytophthora cactorum*. Hydrangeas growing under glass were attacked by *Oidium hortensiae* [*Microsphaera polonica*: ibid., xxv, p. 451], only the inflorescences being affected.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1941.** [Review of phytopathological records noted in 1941.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 1, pp. 1–62, 1 fig., 1942. [Received June, 1946.]

This report [cf. preceding abstract] contains numerous items of phytopathological interest of which the following may be mentioned.

Vine leaf roll ('arricciamento') [vine mosaic virus: *R.A.M.*, xvii, p. 727; xviii, p. 810], as determined by the presence of endocellular cordons, was observed on mother plants in Palermo, on Rupestris du Lot vines and Berlandieri hybrids, and in 26 bundles of cuttings from Trento, consisting of Volano grafted on Teleky. In one vine endocellular cordons were found seven months after grafting. In vine branches from two plantings of mother vines severely affected with leaf roll these formations were abundantly present. Cuttings taken from American vines in Palermo were also affected.

Pear leaves from Rome bore large yellow spots showing the pycnidia [spermogonia] and aecidia of *Gymnosporangium sabinae* [ibid., xx, p. 382]; junipers in the same locality bore teleutosori of the same fungus. Pear fruits of the Passa crassana, Decana d'inverno [winter], and Butirra Clairgeau varieties showed rotting due to an *Alternaria* of the *A. tenuis* group and to *Macrosporium commune* [? *Pleospora herbarum*: cf. ibid., xviii, p. 141]; the Louis Pasteur variety appeared to be highly resistant. Almonds were affected by *Clasterosporium carpophilum*. Loquats in different parts of Lazio showed infection by *Fusicladium dendriticum* var. *eriobotryae* [ibid., xix, p. 582]. Lemons at Quinto developed leaf infection by *Phyllosticta disciformis*. Citrons (*Citrus medica*) in Potenza developed a sudden wilt associated with *Deuterophoma tracheiphila*.

Branches of Aleppo pines [*Pinus halepensis*] near Genoa were affected by a progressive wilt due to the aecidial stage of *Cronartium ribicola*, and also showed the presence of *Sphaeropsis ellisii* [*Diplodia pinea*: ibid., xxi, p. 398] which caused a wilt of the younger branches. *Salix* sp. leaves showed spotting due to *Gloeosporium beckianum*. Lilac near Rome was affected by *Gloeosporium syringae* and *Pseudomonas syringae* [ibid., xix, p. 134] and oleander by *Bacterium tonellianum* [or *Pseudomonas savastanoi* var. *nerii*: ibid., xiii, p. 748; xxv, p. 251].

Wheat at Tiene developed foot rot due to *Leptosphaeria herpotrichoides* [loc. cit.], while at Pescara young wheat plants, following cold, became severely infected by *Erysiphe graminis*. Maize suffering from severe insect infestation developed root infection by *Rhizoctonia* and culm infection by *Helminthosporium turcicum* and *Fusarium* sp. Watermelons at Lucca were attacked by *F. bulbigenum* var. *niveum*; the disease affected an area of 10 ha., and had been growing progressively worse for four or five years. Beets near Naples showed severe leaf infection by *Uromyces betae*, while the roots were attacked by *Sclerotium rolfsii*. At Catanzaro and Crotone beet leaves developed infection by *Peronospora schachtii* [ibid., xxiii, p. 80]. Hemp stalks at Modena showed lesions due to *Botryosphaeria marconii*; as well as the ascigerous stage, the fungus also showed the conidial forms *Dendrophoma* [*D. marconii*: ibid., xxiii, p. 254] and *Macrophoma*, while a whitish layer due to secondary infection by a *Fusarium* was also present. Kentucky tobacco plants at Salerno showed root swellings probably due to *Pseudomonas* [*Bact.*] *rhizogenes*, apparently not previously reported on tobacco.

Padwick (G. W.). **India and Burma. New plant diseases recorded in 1939.** —*Int. Bull. Pl. Prot.*, xiv, 9, pp. 163M–164M, 1940. [Received July, 1946.]

This list of new plant diseases recorded in India and Burma in 1939 includes, *inter alia*, *Phomopsis* sp. causing a seedling wilt of tea in Assam.

Beattie (A. G.). **Annual Report, Agricultural Department, Nigeria, 1944.**—47 pp., 1946.

In the course of a survey in November, 1944, swollen shoot disease of cacao [*R.A.M.*, xxv, p. 441] was found in two separate localities in Oyo Province. In Adamawa and Niger Provinces groundnut rosette disease [ibid., xviii, p. 434] was widespread, but its incidence in the other principal groundnut-producing provinces was not abnormal.

Swollen shoot of Cacao. How to recognize and control.—[*Publn*] *West Afr. Res. Inst.*, 20 pp., 14 figs., 2 maps, 1945.

This paper describes control measures against swollen shoot disease of cacao [see preceding abstract] applied during 1940–1943 by the Department of Agriculture, Gold Coast, published in 1945, with an amendment slip indicating that in several respects the recommendations have become obsolete in the course of the preceding year's work.

Roemer (T.). **Ausgangsmaterial für die Resistenzzüchtung bei Getreide. Ergebnisse 20jähriger Arbeit der Pflanzenzuchtstation Halle a. S.** [Starting material for resistance breeding in cereals. Results of 20 years' work at the Plant Breeding Station of Halle a. S.]—*Z. PflZücht.*, xxiv, pp. 304–332, 1942. [Received August, 1946.]

Many of the studies referred to in the author's survey of 20 years' developments in the breeding of cereals for disease resistance at Halle a. S., Germany, have already been noticed in this *Review*. The following is a summary of the outstanding results. The so-called 'land' varieties, defined as type mixtures arising through purely natural selection, are by no means less susceptible to artificial infection by fungal leaf and ear pathogens than are the élite selections. The former, therefore, should no longer be regarded as 'sound', robust material for breeding purposes, nor is there any reason to discard the reputedly 'sickly, over-bred' élite selections as parental stocks.

Some of the foreign selections resistant to one or more diseases in their countries of origin reacted similarly at Halle to the majority of German physiologic races of the pathogens concerned, whereas others, resistant at home, succumbed to the particular races predominating in Germany. Representatives of the former group constitute very valuable starting material for resistance-breeding operations, and a close watch should therefore be kept on progress in this direction in foreign countries.

Some of the barley forms collected by the German Hindu Kush expedition (*Kühn-Arch.*, liv, pp. 295–368, 1940) were absolutely resistant to leaf and ear diseases, but their many defects in growth habit, incidental to primitive types, necessitate repeated back-crossing to the cultivated parent of the progeny of commercial × primitive crosses to secure an attractive product.

For certain objects interspecific crossing among cereals is indispensable, e.g., *Triticum vulgare* × *T. spelta* or *T. durum* for rust (*Puccinia* spp.) resistance in wheat, *T. vulgare* × *T. persicum* for resistance to mildew (*Erysiphe graminis tritici*) in the same host, and *Avena sativa* × *A. byzantina* for resistance to loose smut (*Ustilago avenae*) in winter oats. Particularly useful as starting material are selections from such interspecific crosses, representing as they do the first stage in breeding for resistance, in which the principal difficulties have already been overcome, and absolute resistance to all races of a given fungus or combined resistance to several diseases is inherent. As the work of selection proceeds, recourse to hybridization with other species and primitive or wild forms should become increasingly rare, and one of the foremost tasks of the scientific institutes should be the production and development of first-stage new combinations for private breeders. Large-

scale efforts to reduce the 10 per cent. toll levied by the chief diseases on the German harvest will then be practicable.

Sibilia (C.). **Alcune razze fisiologiche di Puccinia graminis tritici 'Erikss. et Henn.' nell' Africa Orientale Italiana.** [Some physiological races of *Puccinia graminis tritici* Erikss. & Henn. in Italian East Africa.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 2, pp. 115–118, 1940. [Received June, 1946.]

From Arésss wheat grown at Makallè [Abyssinia] and wheat of an undetermined variety grown at Harar [Abyssinia] the author obtained two physiologic races of *Puccinia graminis*, determined as A.O.I. 13 and A.O.I. 3 [*R.A.M.*, xix, p. 395] respectively. These records extend the areas in which these races had previously been found. At the time of writing the three most prevalent races locally were A.O.I. 3, found in Shoa [Abyssinia] and Harar, A.O.I. 13 in Galla, Sidamo, and Eritrea, and A.O.I. 17 in Asmara [Eritrea] and Shoa.

Borzini (C.). **Sull' efficacia anticrittogamica e sul valore agrario di produtti mercurio-furanici. Secondo contributo sperimentale.** [On the fungicidal efficacy and the agricultural value of mercuric-furfuranic compounds. Second experimental contribution.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 3, pp. 167–188, 1940. [Received June, 1946.]

Further experiments on the biological effects of mercuric-furfuranic compounds [*R.A.M.*, xix, p. 268] showed that the product F.R.M. obtained from the reaction of furfural and mercuric chloride in equal parts, and used at 5 to 10 per cent. with an inert powder (talcum), is very active as a dry seed treatment for wheat bunt (*Tilletia tritici*) [*T. caries*]. The same can be said of R.F.R., a furfural-mercuric chloride. The proportion of mercury in these two products is only from 1·8 to 3 per cent., but is sufficient to make them as effective in practice as the usual copper oxychloride and calcium materials which contain 16·5 per cent. copper. Preliminary tests indicate that seed treatment with F.R.M. increases wheat yield as much as uspulun does. Products obtained from the reaction between mercuric chloride and furfurilic alcohol, while markedly fungicidal, are distinctly inferior to F.R.M. and R.F.R. as seed treatments. The mercuric-furfuranic products tested showed less fungicidal activity against *T. caries* as soil disinfectants than as seed treatments.

Pal (B. P.) & Mundkur (B. B.). **Studies in Indian cereal smuts. VII. Further studies in varietal resistance of Indian and other Wheats to loose smut.**—*Indian J. agric. Sci.*, xv, 2, pp. 106–108, 1945.

The reactions of 26 Indian and 25 foreign wheat varieties to two races of loose smut [*Ustilago tritici*], L1 and L2, prevalent in India [*R.A.M.*, xxiii, p. 432] are tabulated, and those of 62 new strains of hybrid origin briefly summarized. Nearly 50 per cent. of the varieties tested were resistant to both strains, including the commercially important Imperial Pusa 114, 120, and 165, and Khapli, the Imperial Agricultural Research Institute selections IP 121, 122, 124, 163–3, 163–4, 114–1–8, 120–7, 120–8, and 120–19, and a number of imported varieties, among them three out of four lines of Federation, the rust [*Puccinia graminis*]-resistant Kenya wheats, E114, 148, and 220, and Reliance [ibid., viii, p. 638; xx, p. 560]. Of the new hybrids, 22 were immune from, or very highly resistant to, both races of the smut.

Andrén (F.). **Ett fall av groningsskada på höstsäd.** [A case of germination injury in autumn seed.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 2, pp. 25–27, 1946.

The effect on the germinability of Ergo wheat seed-grain with moisture contents of 17, 18·5, 21·3, and 23·4 per cent. of treatment with abavit (200 gm. per 100 kg.)

was tested, one lot of each being sown immediately and the other after three weeks' storage [cf. *R.A.M.*, xxv, p. 207]. The fungicide did not contribute to the fall in germinability, but moisture was progressively more deleterious at the higher levels, a heavy drop (20 per cent. and upwards) occurring in samples with the two highest moisture contents. In another series of tests, in which untreated seed-grain of the same variety with moisture contents ranging from 16·6 to 23·1 per cent. was (*a*) sown at once or (*b*) stored for four or eight weeks, the germinability of the former was roughly equal at all moisture contents, whereas that of the latter sank progressively with rising moisture and after two months at the higher concentrations was practically nil, due to heavy contamination with moulds (*Fusarium*, *Penicillium*, *Mucor*, etc.).

Ekstrand (H.). **Höstsäden och vinterhärdighetsproblemen.** [Autumn cereal seed and the problem of winter-hardiness.]—*Växtskyddsnotiser*, *Växtskyddsanst.*, *Stockh.*, *1946*, 1, pp. 15–16; 2, pp. 17–21, 1946.

During the exceptionally cold winters of 1939–40, 1940 -1, and 1941–2, the injury suffered by wheat was most severe in the south and central regions of Sweden, where the snow cover was too thin to afford adequate protection to the seed. In the north, on the other hand, damage to this crop tends to predominate in mild, snowy winters, which favour the development of fungi associated with winter injury, such as *Typhula* spp., *Sclerotinia borealis* [*R.A.M.*, xxiii, p. 99], and *Fusarium*.

Winter injury to rye, according to the author's observations, is seldom or never occasioned exclusively by cold. As regards reaction to the snow mould (*F. nivale*) [*Calonectria graminicola*: ibid., xxv, p. 103], rye varieties fall into two groups, one more resistant, comprising, for example, the Finnish Oiva and Toivo, besides Sangaste, Björn, the 'midsummer ryes', and certain 'land' sorts, especially those of Norrland, and the other, relatively susceptible, including Kung, Stål, and selected Vasa II. Generally speaking, wheat is more susceptible than rye to *T.* spp., notably *T. itoana* and *T. borealis*, but as in the case of the snow mould, some rye varieties are more liable than others to infection by these fungi. Like *C. graminicola*, *T.* spp. are more prevalent in the north than in the south of Sweden, and *S. borealis*, which may assume a catastrophic form, not only on wheat and rye but also on pasture grasses, has never been found by the writer farther south than Dalarna and Gästrikland. As far as rye is concerned, the winter-injury fungi constitute the limiting factor in its cultivation in the north, where the regression of the crop is perhaps partly due to the replacement of the old, resistant, but unproductive 'land' varieties in favour of the more modern high-bred types which give prolific yields under favourable conditions but may be unequal to the rigours of the more 'normal' northern winters.

Voss (J.). **Zur Prüfung der Resistenz von Hafersorten gegen Flugbrand (Ustilago avenae [Persoon] Jensen).** [On the testing of Oat varieties for resistance to loose smut (*Ustilago avenae* [Persoon] Jensen).]—*Z. PflZücht.*, xxiii, pp. 20–46, 4 figs., 1 map, 1941. [Received August, 1946.]

From 1936 to 1938 greenhouse and field tests were carried out on an extensive assortment of oat varieties for their reactions to loose smut (*Ustilago avenae*) by Reed's method [*R.A.M.*, v, p. 27; ix, p. 102; x, p. 652]. Weakly pathogenic strains of the smut predominated in the bulk of the collections (over 100) from different parts of Germany serving as inoculum, so that the cultivation not only of highly, but even of moderately, resistant varieties affords good prospects of practical control. Of the commercial varieties included in these trials, 19·5 per cent. proved to be highly or moderately resistant, among them being Schwarzer Präsident, Rotenburger Schwarz, Anderbecker Gelb, Carstens V (yellow), Endress Franken, Kraffts Rheinischer Gelb, Lischower Früh, and v. Lochows Gelb, while of the new

selections tested in 1937 and 1938, 25 per cent. were highly resistant and 33·3 per cent. moderately so.

Ruggieri (G.). **Il manifestarsi in natura delle infezioni di 'mal secco' attraverso i 'Verdelli' primaverili.** [The manifestation in nature of infections by 'mal secco' of early forced Lemons.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 2, pp. 150–155, 1 col. pl., 1940. [Received June, 1946.]

Repeated observations both in the field and the laboratory have shown that the agent of citrus 'mal secco' disease (*Deuterophoma tracheiphila*) [*R.A.M.*, xxv, p. 439 and next abstracts] can penetrate the zone where the fruits are attached to the peduncle. The fungus then spreads along the fibrovascular bundles of the fruit and peduncle and finally reaches the main branches. The most obvious symptom of such primary infections is a premature, rapid yellowing of the fruit and peduncle, which quickly withers, causing the drying and shedding of the fruit. The fungus was repeatedly isolated from the fibrovascular bundles of the fruit which turn chestnut-colour, from the peduncle, and from the characteristic carrot-yellow wood of the branch bearing the infected fruit at distances up to several decimetres away from the fruit. How *D. tracheiphila* penetrates the fruit has not so far [at the time of writing] been determined. The fruits most commonly attacked are forced lemons (verdelli) which reach commercial maturity between the end of April and the beginning of June.

Ruggieri (G.). **Relazione sull' attività del 'Posto di Osservazioni sul mal secco degli Agrumi' nel 1940.** [Report on the activity of the 'Observation post for Citrus mal secco' in 1940.]—*Boll. Staz. Pat. veg. Roma*. N.S., xx, 4, pp. 303–329, 10 figs., 1940. [Received June, 1946.]

In this detailed report on studies carried out during 1940 on citrus mal secco disease (*Deuterophoma tracheiphila*) in Italy [see preceding and next abstracts], with special reference to resistant lemon varieties and to citrus varieties that may prove suitable to replace the susceptible bitter orange [*R.A.M.*, xxiii, p. 128] as stock, the author also deals with the form of the disease known to growers as 'mal nero'. His work showed that the presence in the woody tissues of the branches and trunk of large, irregular, brown or pale black, inky spots with orange or carrot-red outer margins [cf. ibid., ix, p. 645] is a well-known symptom of mal secco and is not due to any other disease. From the many isolations from affected material only *D. tracheiphila* was obtained. If the progress of the disease is sometimes 10 to 20 times as rapid as usual ('mal secco fulminante' or 'lightning mal secco'), this is due to spread of the fungus from the roots or stem base upwards (instead of the usual downward progress) and is facilitated by want of cultural care.

Ruggieri (G.). **Relazione sull' attività del 'Posto di Osservazioni sul mal secco degli Agrumi' nel 1941–42.** [Report on the activity of the 'Observation post for Citrus mal secco' in 1941-42.] –*Boll. Staz. Pat. veg. Roma, N.S.*, xxii, 1, pp. 63–86, 3 pl., 4 figs., 1942. [Received June, 1946.]

Notes are given on the general behaviour of different lemon varieties in various parts of Sicily. Observations on the susceptibility of different stocks to natural infection by mal secco (*Deuterophoma tracheiphila*) [see preceding abstracts] showed that the resistance of the Bouquetier variety of bitter orange among two-year-old plants raised in the nursery was much less than that of adults of the same variety, 68 of 353 seedlings, or 19·2 per cent., developing infection. Seedlings of ordinary bitter orange, however, showed 42·4 per cent. infection (109 of 257), of much more severe intensity. Rough lemon (*Citrus limonia*) was highly susceptible, and of 299 two-year-old seedlings cultivated in the nursery, 140, or 46·8 per cent., became affected. This result was partly due to the marked susceptibility to cold shown by rough

lemon. Of the limes only the Palestine sweet lime (*C. aurantifolia*) appeared to be very satisfactory, not more than 50, or 21·3 per cent., of 239 two-year-old plants becoming affected. The Yuzu orange (*C. junos*) was highly susceptible. The Calamondin orange (*C. mitis*) developed only 20 per cent. infection among 25 two- and four-year-old plants, but did not appear to be well adapted to the local conditions.

In an experiment on the manner of spread of the disease, young Bouquetier bitter oranges were planted all round an affected lemon. For the first few months the bitter oranges appeared to remain healthy, but later they developed infection, nearly all the diseased trees occurring along a line running south-west from the focus of infection, in the direction of the prevailing north-east wind.

Petri (L.). **Sul creduto originale della 'Phoma limonis' Thümen.** [On the presumed type specimen of '*Phoma limonis*' Thümen.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 2, pp. 157–160, 1 pl., 3 figs., 1941. [Received June, 1946.]

The author reports the results of his examinations of specimens labelled *Phoma limonis* [see preceding abstracts] in Penzig's herbarium, from which he concludes that authentic material of the species is lacking and the species can be based only on Penzig's diagnosis and drawings. It would be possible, therefore, to maintain, as Gassner has done [loc. cit.], that *Deuterophoma tracheiphila* may be a synonym of Thümen's species, but for the fact that *D. tracheiphila* is quite certainly of recent introduction into Sicily and Calabria, and has never been found in central and northern Italy, while *P. limonis* is very uncommon in southern Italy.

Fawcett (H. S.), Klotz (L. J.), Wallace (J. M.), Zentmyer (G. A.), Rohrbaugh (P. W.), & Schneider (H.). **Quick-decline studies.**—*Citrus Leaves*, xxvi, 4, pp. 6–9, 16, 22, 28, 38–40, 1946. [Abs. in *Chem. Abstr.*, xl, 14, p. 4115, 1946.]

This is a progress report from the Citrus Experiment Station, Riverside, California, on a year's trials and observations in connexion with the quick-decline disease of sweet orange trees grafted on sour orange stock [*R.A.M.*, xxiv, p. 312]. A decrease of starch precedes the death of the roots or top symptoms, progressing from the tips of the smaller roots to the larger main ones. By the time root decay becomes noticeable most of the roots and the sour orange part of the trunk are empty of starch, apparently as the result of the stoppage of food movements from the leaves to the root system. Bacterial or fungal infection of the roots appears to be an indirect or secondary cause of death. No benefit was derived from a number of disinfectant, fertilizer, vitamin, and hormone treatments tested. Twigs from diseased trees usually showed a lower respiration rate than healthy ones. Attempts at the transmission of quick decline by inoculation and grafting gave negative results.

Dastur (R. H.) & Singh (S.). **Studies in the periodic partial failures of the Punjab-American Cottons in the Punjab. XIII. Manuring of Cotton.**—*Indian J. agric. Sci.*, xiv, 4, pp. 325–332, 2 figs., 1944.

This contribution to the studies in progress on the tirak disease of Punjab-American cottons in the Punjab [*R.A.M.*, xxiv, p. 313 and next abstract] consists of a tabulated survey of the practical aspects of manuring in relation to the nitrogen status of the soil.

Dastur (R. H.) & Ahad (A.). **Studies in the periodic partial failures of the Punjab-American Cottons in the Punjab. XIV. Mineral metabolism of normal and tirak-affected plants. XV. Formation of proteins, oil and cellulose in the bolls of normal and tirak-affected plants.**—*Indian J. agric. Sci.*, xv, 2, pp. 63–85, 20 graphs, 1945.

A study of the mineral uptake of normal and tirak-diseased cotton plants [see preceding abstract] on two soil types, (*a*) light, sandy, nitrogen-deficient, and

(*b*) sandy loam with saline subsoil, as reflected in the chemical composition of leaves and bolls at varying stages of development, revealed a shortage of potash at the fruiting period on both soils. The deficiency of the element in the light, sandy soil was an indirect sequel to the insufficiency of nitrogen, the application of which simultaneously increased the assimilation of potash. On the saline soil the potash deficiency was probably associated with a state of physiological drought which impeded the absorption of nutriments.

Protein formation in tirak-diseased cotton bolls ceased from the fifth week of development, instead of being continued until the eighth, as in healthy plants. The decreased rate of protein synthesis was accompanied by a reduction in the dry matter of the bolls. The oil content of diseased bolls was also lower than that of sound ones. The carbohydrate analysis of diseased and healthy bolls revealed no differences, and it is therefore reasonable to conclude that potash deficiency was the primary cause of immaturity in the seeds of the tirak plants. Another feature of the disorder was the low cellulose content of the lint, apparently connected with a decrease in the secondary thickening of the fibre.

Gigante (R.). **La 'mazzarella' del Cotone.** ['Mazzarella' of Cotton.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 4, pp. 332–351, 1 pl., 11 figs., 1941. [Received June, 1946.]

During 1941 the author observed in Sicily a wilt of cotton, referred to by the local growers as 'mazzarella', in which the leaves gradually became flaccid, turned yellow, drooped, and finally withered completely, this stage being followed by the death of the plant. The diseased plants were easily pulled out of the ground, when it was noted that the part just below the collar was considerably swollen and club-shaped ('mazzarella' being Sicilian for a small club). As a rule the affected underground part ended abruptly at this swelling, with no trace of the roots except for a short piece a few cm. long under the collar, which was perpendicular, slightly curved, or elbow-shaped.

Evidently the condition was due to the loss of the root system. No pathogenic organism was found in the affected plants. Wilting was confined almost exclusively to places where the soil was compact, hard, and dry, from which it was concluded that it was due entirely to mechanical factors. Control consists in thorough cultivation before sowing, and destruction of all weeds. Once a fine tilth has been secured the soil should be maintained in this condition.

Gassner (G.). **Die Topallik-Erkrankung der Baumwolle.** [The 'topallik' disease of Cotton.]—*Phytopath. Z.*, xiv, 5, pp. 518–521, 5 figs., 1944. [Received August, 1946.]

The 'topallik' ('lameness') disease of cotton prevalent over wide areas of Turkey from 1936 to 1938, and characterized by the semi-total absence of roots and consequent wilting, was found to be due to excessively high salt concentrations in the soil during the heat of summer; the presence of salt was reflected in the growth of halophytes among the weed flora.

Knight (R. L.). **Breeding Cotton resistant to blackarm disease.**—*Emp. J. exp. Agric.*, xiv, 55, pp. 153–160, 1946.

A preliminary survey of blackarm disease (*Bacterium* [*Xanthomonas*] *malvacearum*) which includes angular leaf spot, bacterial blight, and bacterial boll disease, showed all Egyptian strains to be highly susceptible (though some recovered better than others). In these circumstances it was sought to transfer by backcrossing to the susceptible Sakel genotype the resistance observed in some American Upland (*Gossypium hirsutum*) and Punctatum (*G. hirsutum* var. *punctatum*) cottons

[*R.A.M.*, xxiii, p. 341]. This was successfully accomplished and, as a result, Egyptian strains, fortified with the main genes governing blackarm resistance, are in cultivation. Sakel, the susceptible *G. barbadense* variety, did produce one resistant plant, subsequently ascribed, however, to an out-crossing to *G. hirsutum* and accidental back-crossing in the field. A resistant subdivision has been added to the species by the inclusion of *G. darwinii*, having blackarm resistance, as a variety of *G. barbadense* by J. B. Hutchinson *et al.* ('The Evolution of Gossypium', Oxford University Press, 1946). A further variety in the *G. barbadense* group showing marked resistance, BP 1–1 (Grenadines White Pollen), has been found among the Empire Cotton Growing Corporation's type collection from Trinidad, but has not yet been genetically analysed. All of these will provide material on which further breeding experiments will be based.

Of the resistance factors so far investigated the weak dominant gene B_1 derived from Uganda B31 confers on *barbadense* a resistance slightly greater than that of typical susceptible Upland. Combined with B_2 the resulting resistance is slightly more than with B_2 alone. B_2, the strong dominant gene from Uganda B31, occurs also in some other Upland varieties and in some *punctatum* ones. On the Upland background it gives resistance graded at 6, ranging to 7 under conditions of high humidity, while on *barbadense* cottons it confers grade 7 resistance. In field trials in different localities in the Sudan the Upland variety BAR 7/1 (homozygous for B_2) gave 64 per cent. higher lint yield than a susceptible variety from the same parents and showed much greater 'highest standard counts' (45 and 63 as against 40 and 58). In similar trials BAR 1730L (X1730A to which B_2 has been transferred) [*R.A.M.*, xxiv, p. 449] showed corresponding superiority as regards yield over X1730A, and NT2/41 yielded 665 lb. per acre as against 550 from its counterpart not carrying B_2. Factor B_3 when homozygous confers grade 5·1 to 7·1 resistance on the *barbadense* and Upland types. It is linked to B_2 and the effect of both together is additive; this combination should be used, therefore, wherever blackarm is likely to be severe, with B_1 added to the *barbadense* types intended for these areas.

Resistant types pure-breeding for B_2 are: 513 (ex Punjab Early Strain); MU 8b; U4 Nyasa 5; Uganda Nos. B31, B181, and SP102; NT205/43 (ex Uganda SP20); BAR 7/1 (ex Uganda SP 84); Dharwar American N5 (small sample); BAR 11/2 (XA129 hybrid); BAR 12/1 (Uganda BP 52 hybrid); and BAR 10/2 (Deltapine hybrid). Synthesized types are BAR 13/1 (511 carrying B_2 and B_3) and BAR 7/6 (Uganda SP84 carrying B_3 without B_2).

Muspratt (J.). **Experimental infection of the larvae of Anopheles gambiae (Dipt. Culicidae) with a Coelomomyces fungus.**—*Nature, Lond.*, clviii, 4006, p. 202, 1946.

An experimental infection of laboratory-hatched larvae of the malaria vector, *Anopheles gambiae*, with a fungus of the genus *Coelomomyces* [*R.A.M.*, xxiv, p. 504] was undertaken in Johannesburg with the object of exploring the possibility of employing these fungi for the biological control of dangerous mosquitoes.

From 300 to 400 infected *A. gambiae* larvae, charged with thick-walled sporangia, were collected and placed in jars containing water and soil from the infected breeding place at Livingstone, Northern Rhodesia. On the death of the larvae, the soil was allowed to become almost dry, and this, together with about 100 lb. nearly dry clay soil from the same vicinity, was sent to Johannesburg, where it remained in the laboratory throughout the winter. In the summer the main bulk of the soil was heaped in a concrete trough exposed to the sun for three to four hours daily and protected from rain, the soil containing the resting sporangia in the larval remains being scattered over the lower part of the heap. Rainwater was then poured over the soil and newly hatched larvae of *A. gambiae* added. Evaporation to dryness

was allowed to take place every two or three weeks, and the trough to remain dry for three to four days before being refilled and another batch of newly hatched larvae put into it. About 15 of 100 larvae of the second batch became heavily infected, and a few of the later batches, but larval growth was not normal under the conditions at Johannesburg. The author believes that in a suitable climate indefinite infection of *A. gambiae* larvae would be achieved.

Macedo (A.). **Doenças da Agave.** [*Agave* diseases.]—*Bol. Minist. Agric., Rio de J.*, xxxii, 7, pp. 27–28, 1943. [Received 1945.]

Sisal hemp is stated to be subject to anthracnose (*Colletotrichum agaves*) [*R.A.M.*, xvii, p. 322; and cf. xxv, p. 394], *Dothidella parryi* (Farl.) Theiss., and *Lembosia dendrochili* Lev. in Puerto Rico, *Marssonia* [*Marssonina*] *agaves* [ibid., viii, p. 526] in Colombia, *Septoria megalospora* in Argentina, and *Tubercularia agaves* in Costa Rica. In the State of Parahyba, Brazil, material has been collected of the leaf-spotting fungi, *Pleospora* sp. and *Phyllosticta* sp., while the ordinarily resistant *Agave fourcroides* was attacked by *Didymaria* sp., the foliar depressions induced by which exuded a viscous substance. Anthracnose (*Gloeosporium* [*C.*] *agaves*) has also been reported from Brazil.

Andrén (F.). **Betningsförsök med Lin- och Hampfrö.** [Disinfection experiments with Flax and Hemp seed.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946.* 1, pp. 10–12, 1946.

In 1945, at the Plant Protection Institute, Stockholm, samples of flax seed infected by fusariosis [*Fusarium lini*] and hemp by *Botrytis* and other fungi were treated with five standard fungicidal dusts at dosages of 200 and 400 gm. and panogen [*R.A.M.*, xxv, p. 207] at 200 and 400 ml. per 100 kg. The average increase in emergence of the treated flax seedlings was 13·6 per cent., for both concentrations, panogen being rather more efficacious than the dusts. The average increase in harvested plants from the standard treatment was 13·3 per cent. (12·3 for the 400 gm. rate and 14·3 for the 200 gm.).

The average increases in emergence of the disinfected hemp seedlings was 17·6 per cent. (22·6 for the 400 gm. rate and 12·8 for the 200 gm.), and the figures were significant for all the treatments except betoxin 61, fusariol 3140b, and abavitneu at the lower dosage. The average increase in harvested plants was 12·4 per cent., and the figures were significant for all the treatments except germisan and abavitneu at 200 gm.

Timmermans (Adriana S.). **Het Botrytis-rot der Gladiolen veroorzaakt door Botrytis gladiolorum nov. spec.** [The *Botrytis* rot of *Gladioli* caused by *Botrytis gladiolorum* n. sp.]—*Meded. Lab. Bloembollenonderz. Lisse* 67, 32 pp., 22 figs., 2 graphs, 1941. [German and English summaries. Received 1945.]

Since 1929 a *Gladiolus* corm rot has been observed at the Bulb Research Laboratory, Lisse, Holland, which became increasingly troublesome from 1937 onwards. It is characterized by two types of foliar spots, one oblong, dry, brown, with red margins, and the other small, round, and rust-coloured, the latter also occurring on the stems; water-soaked, oval lesions on the flowers; and decay passing down the vascular bundles of the stem to the heart of the corm, which bears brown spots of irregular size and shape and small ones closely resembling those of dry rot (*Sclerotinia gladioli*) [*R.A.M.*, xiii, p. 461; and cf. xxv, p. 394], probably a frequent concomitant of the pathogen. All the lesions yielded in pure culture on prune agar a species of *Botrytis* to which the name of *B. gladiolorum* n. sp. is assigned [without a Latin diagnosis]. Its hyaline, oval to ovate or quasi-spherical conidia, borne on pale grey-brown conidiophores, measure 10 to 22 by 8 to 13 (average 15 by 10) μ,

and are thus distinct from those of *B. gladioli* Kleb. [ibid., x, p. 274], which measures 8 to 15 by 3 to 6 (10·4 by 4·7) μ and are produced from dark brown conidiophores. The minimum, optimum, and maximum temperatures for the growth of the fungus are below 3°, 20° to 22·5°, and 30° C., respectively, and the optimum and maximum pH 5 to 5·5 and 7, respectively.

The progressively heavy damage caused by the disease of recent years is attributed to the extreme susceptibility of the leading new varieties; the inability of some growers to provide the necessary ventilation and heating in their store-rooms; and the prevailing weather conditions, which have been conducive to the development of infection.

Experiments have shown that the incidence of the rot is lower on corms lifted early (24th September to 4th October) than on those left in the ground until mid-October. Storage at a temperature of 25·5° or 30° promotes rapid drying of the corms and precludes any appreciable spread of infection, but those kept for a month in a cold, damp place undergo extensive decay, which may be mitigated to some extent by pulling off the stems immediately after lifting, rather than cutting them off at some distance from the corm.

LIMBER (D. P.). **A note on the distribution of black rot of Orchids.**—*Plant Dis. Reptr*, xxx, 3, p. 89, 1946. [Mimeographed.]

Three of the 13 interceptions of orchids on account of black rot (a disease attributed to various Pythiaceae) made by the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture (unpublished records), were associated with a Phycomycete with subspherical sporangia smaller than those of the more common Pythiaceous fungus with ovate, papillate sporangia found in the other material examined. The three specimens in question were hothouse-grown species of *Cattleya* originating in England, and a fourth from the same country may also have been infected by the fungus with small sporangia, a point that cannot now be ascertained. Seven of the remaining nine wild orchids came from Venezuela, six *Cattleya* and one (?) *Epidendrum*, and one each from Colombia (*Cattleya*) and Cuba (*Oncidium*).

V. Rossetti, describing a black rot of orchids in São Paulo, Brazil [*R.A.M.*, xxiii, p. 64, where the place of origin is given in error as Buenos Aires], states that the same or a similar disease of *Cattleya* and *Vanda* has been reported from Puerto Rico, and of *Stanhopea saccata* from an unnamed locality. Saccardo (*Syll. Fung.*, xii, p. 651, 1897) records *Pythium debaryanum* on *S. saccata* in Germany.

NIEUWDORP (W. A.). **De bladrandchlorose van Rhododendron catawbiense 'grandiflorum'.** [The leaf-margin chlorosis of *Rhododendron catawbiense* 'grandiflorum'.]—Thesis, Wageningen Agricultural College, 180 pp., 41 figs. (11 col.), 3 graphs, 1945. [English, German, and French summaries.]

Chlorosis of the leaf margins is the most prominent symptom of a pathological condition of the economically very important *Rhododendron catawbiense* [var.] 'grandiflorum' in the Boskoop district of Holland. Towards the beginning of July a yellowish-vermilion-green discoloration, densely speckled in transmitted light, becomes perceptible along the margins and between the veins of the first order to about half-way to the midrib. In the autumn, when the leaves are fully developed, the colour contrasts are more accentuated, the affected area by this time having assumed a cadmium-yellow tint. A relatively inconspicuous foliar mottling is another feature of the disorder which often co-exists with the marginal chlorosis. The average chlorophyll content of chlorotic leaves was only 44 per cent. of that of the sound foliage; it tended to be lower in the marbled specimens than in those with marginal chlorosis. Owing to the defective structure of the root hairs, the root-balls of diseased plants are of a very loose texture and easily disintegrate.

The trouble appears to originate in an unduly high proportion of calcium in the soil and a deficiency of nitrogen. Thus, the degree of acidity in the soils giving rise to the *Rhododendron* chlorosis averaged less than one-eighth of that prevailing in ground supporting normal growth, and the nitrogen content of chlorotic foliage ranged from 79·3 to 126·3 mMol per 100 gm. dry material compared with 128·3 to 215 mMol in healthy leaves. A promising line of approach to the problem of control consists in the application of sulphur to the soil at a rate not exceeding 13 lb. per 17 sq. yds.

Lihnell (D.). **Azaleor och Applen.** [Azaleas and Apples.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 1, pp. 7–10, 1 fig., 1946.

Experimental evidence is adduced in confirmation of the view already expressed that the leaf and twig blight of azaleas [*Rhododendron*] imported into Sweden from Belgium is a result of carbon dioxide poisoning during transport [*R.A.M.*, xxii, p. 482], apples in the same hold having been the source of the toxic emanations.

Cohen (C.). **A note on Hollyhock rust (Puccinia malvacearum Mont.) in South Africa.**—*S. Afr. J. Sci.*, xlii, pp. 137–138, 1946.

Moisture appears to be an essential condition for the germination of the teleutospores of hollyhock rust (*Puccinia malvacearum*), which rapidly die when the leaves are allowed to dry. The rust is capable of overwintering by means of the more or less dormant sori on the leaves left at the base of the plant. Germination may occur from early spring to midwinter and be followed by fresh infections under suitable conditions. In the laboratory the spores remained alive for 50 days in a humid atmosphere at a low temperature.

Karel (G.). **Über den Rost von Vinca herbacea.** [On the rust of *Vinca herbacea*.]—*Phytopath. Z.*, xiv, 5, pp. 450–454, 4 figs., 1 graph, 1944. [Received August, 1946.]

In his study on the nomenclature of two *Vinca* rusts, *Puccinia vincae* [*R.A.M.*, xix, p. 599] on *V. major* and *P. cribrata* on *V. minor* (*Phytopath. Z.*, xii, pp. 229–231, 1939), E. Gäumann mentions a third species on *V. herbacea* from Kharkov, Ukraine, the specific identity of which he was unable to determine on the basis of the available material. The rust in question is annually observed at the Ankara (Turkey) Plant Protection Institute, causing foliar stunting and chlorosis and an upward curvature of the shoots, while the normally opposite leaves are arranged in verticils of three. The dimensions of the uredo- and teleutospores agree in essentials with those of *P. vincae* and the undetermined species on *V. herbacea* from Kharkov, but the teleutospores of the Ankara specimens are slightly longer than those given by Gäumann (39·5±3·07 as compared with 36·9±2·59 μ), which would appear to justify the erection of a new form for the latter [see next abstract].

Gassner (G.). **Über Puccinia anatolica n. spec. auf Vinca herbacea W. et K.** [On *Puccinia anatolica* n. sp. on *Vinca herbacea* W. & K.]—*Phytopath. Z.*, xiv, 5, pp. 455–474, 7 figs., 6 graphs, 1944. [Received August, 1946.]

An intensive study of the *Puccinia* described by Karel from Ankara on *Vinca herbacea* [see preceding abstract] revealed differences from *P. vincae* of sufficient magnitude to justify the erection of a new species, *P. anatolica*. The rust forms two types of uredo- and teleutospores under divergent climatic and topographical conditions. The large uredospores measure 27 to 40 (mean 33·8) by 21·1 μ, and the small ones 24 to 35 (30·3) by 24·2 μ. The large teleutospores measure 36 to 54 (42·9) by 19·25 (23·2) μ, and the small ones 31 to 42 (37·6) by 23 to 29 (25·1) μ. The rust overwinters in its host in the mycelial stage, and among the symptoms of

infection are the production by the rhizomes of fascicles of up to 15 shoots and partial suppression of flowering.

HADORN (C.). **Marmorierte Panaschüre oder Gelbfleckigkeit der Blätter von Saintpaulia und verwandter Arten.** [Mottled variegation or yellow spotting of the leaves of *Saintpaulia* and related species.]—*ForschErgebn. Gartenb., 1942*, 1, pp. 13–15, 1 fig., 1 diag., 1942. [Received 1945.]

Saintpaulia and other members of the Gesneriaceae are subject in Switzerland to a foliar variegation consisting of greenish-yellow to yellowish-white, sharply defined spots of very variable size and assuming the most bizarre shapes, the same leaf bearing a variety of lines and spots. The disappearance of chlorophyll from the palisade tissues to which the chlorosis is due is attributed to excessive solar irradiation and abrupt temperature fluctuations, notably in the spring and autumn. Control should be based on the protection of the plants from intensive, direct sunlight and the maintenance of uniform temperatures in the greenhouse.

ISAAC (I.). **Verticillium wilt of Sainfoin.**—*Ann. appl. Biol.*, xxxiii, 1, pp. 28–34, 1 pl., 3 figs., 1946.

This study is based on the isolation by F. T. Brooks in 1940 of a microsclerotia-forming species of *Verticillium*, *V. dahliae*, from wilting sainfoin [*Onobrychis sativa*] plants at the Plant Breeding Institute, Cambridge. It appears to be the first record of the disease in Britain [cf. *R.A.M.*, xxv, p. 166] and to have been restricted to a plot at the Institute and two others in the neighbourhood, no wilt having yet been seen on any of the numerous sainfoin leys in East Anglia.

The fungus is shown as able to penetrate sainfoin seedlings through unwounded roots. The infection causes the outer, and subsequently the inner, leaves to fold upward along the midrib and to become pale green, turning yellow and finally brown. Necrotic collapse, associated with loss of cell turgor, marks the most rapid progress of the disease during the hot months of June, July, and August. Plants show internal dark brown discoloration of the wood characteristic of *Verticillium* hadromycosis; gum inclusions are often present but no tyloses were observed.

Inoculations of both common and giant sainfoin, grown from seed in uninfected soil, by the insertion of a fragment of culture of *V. dahliae* into cuts in the main root just below ground-level and in the stems and inoculations of the soil resulted in wilting after 6 to 12 weeks while the controls remained healthy. *V. dahliae* was reisolated from all the wilted plants. After two days' exposure to a spore suspension seedlings were penetrated in the root cap region, and after nine days they were deeply penetrated at all points of contact.

During experiments for the isolation of *Verticillium* from the naturally infected soil of the Cambridge site, *V. nigrescens* was recovered in every month of the year, but *V. dahliae* only during June, July, and August, and even in these months only from soil within 1 ft. of diseased plants.

V. dahliae, *V. albo-atrum*, and *V. nigrescens* retained their viability for three years on test-tube slants of Dox's or prune-extract agar. With cultures on sterilized wheat grains of these three species and the hyaline variants of *V. dahliae* and *V. albo-atrum*, respectively, maximum viability was found to be for *V. dahliae* 7 to 8 weeks, for *V. albo-atrum* and *V. nigrescens* 12, and for both hyaline variants six months. Tests of the viability of *Verticillium* in unsterilized and partially sterilized potting soil given different amounts of water showed that the fungus could be isolated from all up to 15 weeks but not from waterlogged soils after the same time, while after 22 weeks all attempts at isolation failed for all treatments. These and other experiments suggested that *V. dahliae* is present in the soil in two forms, the microsclerotial form which may persist in the soil for at least five months and the

hyaline variant which is equally virulent but persists for a short time only. Heavy liming caused no reduction in the susceptibility of sainfoin plants to wilt.

COHEN (C.). **A note on the biology of Ustilago cynodontis (P. Henn.) and Ustilago bromivora (Tul.), F. de Waldh.**—*S. Afr. J. Sci.*, xlii, pp. 135–136. 1946.

The writer observed a distinct difference, in respect of germination processes, between *Ustilago cynodontis* from *Cynodon dactylon* [*R.A.M.*, xix. p. 120: xx. p. 382: xxiii, pp. 360, 501] and *U. bromivora* [ibid., xxii, p. 361] on *Bromus unioloides* [ibid., xxi. p. 493], the former germinating readily either immediately on collection or after intervals of storage up to more than 15 months, while the latter failed to do so at all, either spontaneously or in response to various stimulatory treatments.

In the Transvaal, field plants of *C. dactylon* show the first traces of smut about the beginning of October, and thenceforth further infections are likely to occur until the end of the summer. On the other hand, *U. bromivora* tends to develop later on *B. unioloides*, appearing first towards the end of October, and, in some seasons at any rate, producing few sori until later. A correlation may perhaps be discerned between the outdoor behaviour of the two smuts and their divergent modes of germination.

BINGEFORS (S.). **Några iakttagelser beträffande två svampsjukdomar på Lusern.** [Some observations concerning two fungous diseases of Lucerne.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1946*, 2, pp. 30–31, 1 fig., 1946.

Ascochyta medicaginis [*Stagonospora meliloti*], an uncommon parasite of lucerne [*R.A.M.*, xviii, p. 320] in Sweden, caused considerable damage in 1945 in a crop laid down near Upsala for experiments on the best time for harvesting. At the first harvest, in June, the foliage was in excellent condition; at the second, in late July, incipient infection by *Pseudopeziza medicaginis* was apparent; at the third this pathogen assumed a virulent form and *S. meliloti* was also in evidence; while at the fourth, in early October, the latter was destructive and the former had regressed to insignificant proportions. Early harvesting as a precaution against *S. meliloti* would thus appear to be indicated in warm, humid seasons.

WARD (K. M.). **Deficiency disorders in deciduous fruits.**—*Qd agric. J.*, lxii, 4, pp. 215–226, 12 pl., 1946.

Deficiency disorders continue to appear in almost all kinds of deciduous fruits in the Stanthorpe district of Queensland.

Little leaf of apples, pears, and stone fruits and probably also of grape vines [*R.A.M.*, xxiv, p. 421] occurs on all granitic soils [see next abstract]. For control, winter spraying for two consecutive years with zinc sulphate at a concentration of 20 lb. to 80 gals. water (or 40 to 80 lb. in acute cases for the first spraying) is followed in alternate years by the weaker spray in order to retain an adequate balance of zinc in the trees. Pruning should be done beforehand or delayed for at least two weeks to avoid spray injury.

Wither-tip is liable to affect all varieties of apples at various ages in the Stanthorpe district, where it is rather widespread. This disorder has occasionally occurred on pear trees, but has not yet been noted on stone fruit trees although it resembles exanthema of stone fruits attributed to copper deficiency [ibid., xv, p. 730]. It affects all apple trees on newly broken land, whether young or old. The primary symptoms in both apples and pears appear in late spring, the new apical growth being arrested and becoming unhealthy. Brown areas appear on half-grown leaves and on older ones near each tip, quickly followed by necrosis of the tissues in the affected parts, leaving large, irregularly shaped, brown blotches. In the Delicious variety, however, they begin as numerous small red patches,

which soon die, leaving behind blotches about $\frac{1}{8}$ in. in diameter, recalling shot hole in stone fruit leaves. The shoot becomes defoliated for upwards of 9 in. from the tip, wilts, and bends over characteristically to one side. If this stage is reached early in the season, new twigs grow up from live buds below, but become affected later. Unlike little leaf, this disease is not confined to the leaders. The general effect is marked suppression of growth and loss of vigour. A superficial roughening or scurfiness of the bark is a typical symptom and may cover nearly the whole tree, except for first-year shoots. The fine cracks deepen and cause the roughness to become coarse and flaky, if treatment is not given. A Bordeaux spray (4–4–40) in late spring will confer benefit lasting several years, but preferable treatment for both bearing and non-bearing trees is a soil application of $\frac{1}{4}$ to $\frac{1}{2}$ lb. per tree of fine copper sulphate crystals, scattered evenly over a large area round each tree and ploughed in late in the winter so that it becomes available by the following spring and summer. This treatment has ensured freedom from wither-tip for a period of five years.

Damage due to boron deficiencies [ibid., xxiii, p. 334] such as internal cork, corky core, superficial cork or drought spot, and measles [ibid., xvii, p. 400] in apples, and 'hen and chickens' in grapes [ibid., xxiii, p. 206], may be controlled by a foliar spray (0·5 per cent.) or soil applications of $\frac{1}{4}$ to $\frac{1}{2}$ lb. borax per tree, the borax being mixed well with several times its own volume of dry sand or fine soil to secure a wide and even distribution round the tree, which is essential in order to avoid toxic effects. Suitable boron treatments will remain effective for several years. Borax at the rate of 2 oz. per vine is recommended where the 'hen-and-chickens' disorder is present in vineyards, widely scattered and subsequently ploughed in during late winter or early spring. Spray treatment (0·5 per cent.) before blossoming should be repeated the following season to avoid a recurrence of the trouble.

Combined sprays including minor elements are not considered feasible in most cases, but zinc sulphate control for little leaf may be used with winter lime-sulphur. Winter oil sprays should be delayed for a month after applying the zinc sulphate. Borax solution and standard lead arsenate have been combined without injury to the trees.

McWhorter (O. T.). **Zinc-coated nails check 'little leaf'.**—*Bett. Fruit*, xxxix, 10, p. 11, 1945.

The use of zinc-coated nails for checking 'little leaf' [see preceding abstract] in cherry, apricot, peach, pear, walnut, and prune trees is reported as having been successful in eastern Oregon; spraying, however, is recommended for small trees in view of damage to their trunks from the insertion of nails. The nails should be placed 1 in. apart up and down the tree and $\frac{1}{2}$ in. apart transversely in a spiral. From 15 to 20 nails should suffice; their heads should be removed, and they should be driven only half their length into the tree, to avoid damage to the bark. Large trees may require 30 to 40 nails. The curative results usually begin to appear six to eight months after placing and are claimed to be lasting. Foliage sprays confer improvement within 30 days but must be renewed annually.

Florenzano (G.). **Italy. Occurrence and first observations on the production of the perfect stage of Venturia pirina and V. inaequalis in the country.**—*Int. Bull. Pl. Prot.*, xvii, 9, pp. 120M–125M, 6 figs., 1943. [Received July, 1946.]

After stating that attacks of pear and apple scab (*Venturia pirina* and *V. inaequalis*, respectively) are becoming progressively more frequent and threatening in Italy, the author gives a detailed description of these two perfect states, found in late December, 1942, on material collected near Florence in November, and in March, 1943, on leaves from various parts of Italy; ripe perithecia of both species were abundant in the latter collections. With *V. inaequalis*, the ripe peri-

thecia were mostly found on the upper surface of the leaf, and were rather larger than usual, measuring approximately 150 to 160 μ in diameter.

Smock (R. M.) & Southwick (F. W.). **Studies on storage scald of Apples.**—*Bull. Cornell agric. Exp. Sta.* 813, 39 pp., 1 fig., 1 graph, 1 diag., 1944. [Received July, 1946.]

In continuation of their earlier work on storage scald of apples [*R.A.M.*, xxi, pp. 82, 209, 457], the authors present a full account of further studies on the disease. Rhode Island Greening, North-Western Greening, and Cortland are cited as highly susceptible varieties, Rome Beauty, Delicious, Grimes Golden, Stayman Winesap, Wealthy, and Baldwin as frequently affected, and McIntosh and Northern Spy as relatively resistant.

The following measures for control showed varying results: shading branches of Rhode Island Greening and McIntosh trees with cheesecloth during growth usually reduced the incidence of scald in storage; defoliation early in growth seemed to reduce it in many cases; the use of oiled paper proved the best pre-storage treatment, but did not ensure control, while wax emulsion [loc. cit.] proved equally satisfactory on later picked fruit and is suggested for commercial testing; coating the fruit with commercial mineral oil gave variable results with sometimes no effect; nitrogen fertilizer treatments reduced scald little in Rhode Island Greening, but delayed storage may reduce it in this variety, although some shrivelling and more bitter pit are likely. In relative humidity studies scald was worse where there was free water in the experimental chambers, but shrivelled fruits did not as a rule scald badly. A fair correlation between the production of total volatile materials and scald incidence was observed, the disorder proving somewhat severe in McIntosh apples exhibiting high volatile production, which was observed to increase the extent and severity of scald on Cortlands and Greenings. Vapours of ripe fruits of these last two varieties slightly damaged mature fruits in storage, but less than those of McIntosh. A limited commercial trial of activated carbon as an air-conditioning agent is recommended for the removal of scald gases in storage.

Gigante (R.). **Una laciniatura delle foglie di Pesco causata dal freddo.** [Laciniation of Peach leaves caused by cold.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 2, pp. 125–136, 1 pl., 7 figs., 1940. [Received June, 1946.]

The author describes a condition of peach leaves from Trieste characterized by sinuosity of the margins and the presence of circular, elliptical, or irregular holes in the blade. The slashed margins were bounded by a cork layer. The midrib showed necrosis along the whole or part of its length, the necrotic parts being separated from the healthy by corky tissue. Sections along the midrib showed circular or elliptical lacunae filled with gum in the woody tissue. The twigs bearing the affected leaves showed damage by preceding late cold, and the condition of the leaves is attributed to the same cause.

Biraghi (A.). **Sulla presenza di cordoni endocellulari in Mandorli danneggiati da freddo.** [On the presence of endocellular cordons in Almonds injured by cold.] —*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 2, pp. 101–116, 7 figs., 1941. [Received June, 1946.]

An account is given of a wilt of almond trees growing near Palermo which was ascertained to be due to death of the cambium following repeated cold spells. The trees had suffered slightly from the effects of cold during the two previous seasons, and while some of the branches showed only the usual effects of such conditions, others were observed to contain endocellular cordons [cf. *R.A.M.*, viii, p. 546; xvii, p. 95, *et passim*]. Discussing the possible significance of these bodies in various hosts, in the light of his own observations and those of other workers, the author

puts forward the view that they result from disturbances due to environmental factors.

YOUNG (H. H.). **A method of control of the 'gummosis' disease in the Apricot tree.**—*Aust. J. Sci.*, viii, 2–3, pp. 85–86, 4 figs., 1945.

The following method has given satisfactory control of apricot gummosis in South Australia [*R.A.M.*, xxiv, p. 445]: excision of every patch of infection until the fresh wood is reached; painting of the wound, all pruning cuts, and the pruning saw with 1 per cent. gentian violet solution, and sealing with a lead preparation (paint or bitumen); and spraying with Bordeaux mixture by the standard schedule.

BENLLOCH (M.). **Clave para reconocer las plagas y enfermedades del Olivo por sus síntomas externos.** [Key for the recognition of Olive pests and diseases by their external symptoms.]—*Publ. Estac. Fitopat. agríc. Madr.* 16, 14 pp., 23 pl., 1945.

The following pathogens affecting the olive in Spain [*R.A.M.*, xxv, p. 171] are included in this useful, illustrated key for their identification by means of external symptoms: *Cycloconium oleaginum*, *Antennaria elaeophila* [ibid., xx, p. 504], *Stictis panizzei*, *Bacterium* [*Pseudomonas*] *savastanoi*, *Macrophoma dalmatica*, *Gloeosporium olivarum*, *Rosellinia necatrix*, *Armillaria mellea*, and *Fomes fulvus* var. *oleae*.

GIGANTE (R.). **Un grave attacco di 'rogna' sui frutti di Olivo.** [A serious attack of 'knot' on Olive fruits.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 3, pp. 161–166, 1 pl., 5 figs., 1940. [Received June, 1946.]

Olive branches were received by the author which, together with the fruit peduncles, were severely attacked by knot disease (*Pseudomonas savastanoi*) [*R.A.M.*, xix, p. 581 and preceding abstract]. The fruits had sustained even more serious injury. Their development had become arrested, and as a result of the presence of extensive tumours, mostly localized in the basal parts, they were deformed. The fruit tumours in all cases extended to a certain depth in the mesocarp and in many instances reached the stone, though only in one example was the stone affected, the tumour being of very complex nature, beginning in the peduncle and spreading to the mesocarp and stone. The bacterium can attack the stone when the fruit is still in an early stage of development. Externally, the tumours were covered with several cork layers which became lacerated as the tumour enlarged.

PESANTE (A.). **Sopra due micosi dei rametti d'Olivo.** [On two mycoses of Olive branches.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 4, pp. 300–302, 1940. [Received June, 1946.]

In the spring of 1939, in the coastal area of Messina, the young branches of olive trees (mostly on only one side of the crown) partially withered and hung down. The disease, present apparently for some years, had grown worse recently. The wilt started at the apex and spread towards the trunk; the diseased part was sharply marked off from the healthy. From affected material from several different localities the author constantly isolated a fungus belonging to the Sphaeropsidales, which in culture formed sub-immersed, sometimes confluent, thick-walled, round pycnidia measuring 120 to 370 μ in diameter, with bacillary, hyaline spores, 3·2 to 4 by under 1 μ, borne on short, hyaline conidiophores. Inoculations of healthy young olive trees from cultures gave positive results in three months, wilt extending for some cm. from the site of inoculation and the fungus being re-isolated from the affected parts.

Olive trees in Cosenza also showed a defoliation of the young branches, which assumed a characteristic reddish colour; this became even more conspicuous when the bark, which was readily detachable, was removed. The transition from the diseased to the healthy part was gradual. Hyphae were present in the wood vessels only, while gum was sometimes noted in the lumina of the elements of the outer xylem. The condition appeared to be a form of tracheomycosis. Various fungi were isolated from affected material, two Sphaeropsidales by reason of their constant presence apparently being responsible for the condition. In culture, one gave isolated, thick-walled, round pycnidia, 0·5 to 1·2 mm. in diameter, branched, verticillate conidiophores, and allantoid, hyaline conidia 5 to 6 by 1 to 1·2 μ: the other gave a pale red mycelium with needle-shaped dendroid crystals, thick-walled pycnidia 0·4 to 1·2 mm. in diameter, and allantoid, hyaline conidia 6·5 to 7 by 1·2 to 1·5 μ.

McKnight (T.). **Water blister disease of Pineapples.**—*Qd agric. J.*, lxii. 5, p. 278, 1946.

Serious wastage of pineapple fruit in southern Queensland caused by water blister disease [*Ceratostomella paradoxa*] has led the author to renew his recommendations made in 1941 [*R.A.M.*, xx, p. 374] for the control of the disease. Fairly high temperatures and unusually abundant moisture in February and March this year enabled *C. paradoxa* to enter and rapidly rot discarded material, prolific sporulation occurring on the surface.

Ruyle (E. H.), Pearce (W. E.), & Hays (G. L.). **Prevention of mold in kettled Blueberries in No. 10 cans.** -*Food Res.*, xi. 3, pp. 274 279, 1946.

The presence of spores of the unusually heat-resistant *Penicillium* described by Williams *et al.* [*R.A.M.*, xxii, p. 258] on blueberries [*Vaccinium*] grown in many parts of the United States indicates that contamination of the raw product is prevalent. Considerable reduction in infection of the canned product can be secured by thorough washing of the fruit and cleansing of inspection belts and plant equipment, while visible mould growth is preventable by elimination of oxygen from the can through the substitution of nitrogen or other inert gas for the air in the headspace. A method must also be provided for the exclusion of air mechanically entrapped in the berries or for allowing it to escape before sealing the can with inert gas in the headspace. Comparable mould growth occurred in both plain and enamelled cans and was not noticeably affected by the different rates of oxygen disappearance in the two types.

Whelton (Rita), Phaff (H. J.), Mrak (E. M.), & Fisher (C. D.). **Control of microbiological food spoilage by fumigation with epoxides.**—*Food Industr.*, xviii, 1, pp. 91-93; 2, pp. 84-86, 228, 230, 3 figs., 1 graph, 1946.

The use of the epoxides ethylene oxide and propylene oxide, in which an oxygen atom is linked to two connecting carbon atoms in the same chain, as a method of combating microbiological spoilage of unsulphured fruits (prunes and Black Mission figs [*R.A.M.*, xxii, p. 143] in this series of tests) of high moisture content (25 to 26 per cent. in the former case and over 30 per cent. in the latter) was investigated at the Division of Food Technology, University of California.

Figs packed in 12-oz. cartons containing a mixture of ethylene oxide and isopropyl formate were free from moulding or fermentation after six or seven months' storage in large-scale experimental runs in commercial plants, as little as 0·5 c.c. 10 per cent. ethylene oxide per package sufficing to prevent spoilage. Propylene oxide also gave promising results.

The nature of the residues left by epoxide fumigants and their possible toxicity

is discussed. The likelihood of any untoward effects on man from this source is considered to be very remote. A few suggestions are made for other applications of fumigants in general to the problem of microbiological spoilage.

Dean (F. P.). **Injector helps in mixing sprays.**—*Bett. Fruit*, xxxix, 10, p. 13, 3 figs., 1945.

A description is given of a small injector for mixing sprays. It is designed from ordinary pipe fittings. The body is a 1 in. tee with a $\frac{3}{4}$ in. side opening, and is fitted at one end with a 1 by $\frac{3}{4}$ in. bushing and inside this a $\frac{3}{4}$ by $\frac{1}{2}$ in. bushing. A $\frac{1}{2}$ in. plug, with a small hole in the centre, is screwed into the smaller bushing, and should extend at least to the mid-point of the tee. A jet is thus formed, the aperture of which should be varied according to the capacity of the spray pump. An $\frac{1}{8}$ in. opening is suitable to a 20 gals. per minute capacity pump. The injector is connected by high-pressure spray hose to the water pump while the side opening of the tee, fitted with garden hose, receives the concentrated spray materials from the container in which they have been mixed. The opposite end of the tee is fitted with an 18 in. length of 1 in. piping which leads the mixture into the spray tank.

Malquori (A.) & Borzini (G.). **Rame-Bentonite come anticrittogamico.** [Copper-bentonite as a fungicide.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 3, pp. 185–220, 1 fig., 3 graphs, 1941. [Received June, 1946.]

Laboratory studies on fungicides containing reduced quantities of copper prepared with bentonite and copper salts showed that in these products active copper is easily liberated to exert its toxic action against fungal spores, while its activity is naturally potentialized by the colloidal nature of the bentonitic clay.

The evidence demonstrated that ionic copper is of greater fungicidal efficacy than molecular copper. Bentonite copper is equally suitable for sprays made with solutions of inorganic or organic salts, in which the soluble copper is, respectively, in a simple and complex ionic state. The active element contained in the spray residues is more important fungicidally than that contained in the liquid phase of the spray. Confirmation was obtained of the fungicidal action of insoluble copper products due to the solution of the copper by secretions from spores. Cupric sprays containing organic oxyacids and their salts are of greater fungicidal efficacy than those containing inorganic compounds. The organic ions show a stronger tendency to render soluble insoluble copper compounds by forming complex cupro-organic ions which, in association with the copper-bentonite, mobilize both the exchangeable copper and that of the basic salt. Further, the drying of cupro-organic sprays containing copper-bentonite does not result in the copper becoming markedly insoluble.

Combination of organic compounds with copper salts in fungicides would appear to be effective indirectly by facilitating the penetration of the copper into the plant tissues. In copper-bentonite sprays ammonium tartrate was found to be at least as fungicidal as citric acid. The incorporation of colloidal argillaceous materials, such as bentonite, improved fungicides by increasing their adhesiveness.

These results are considered fully to justify the use of copper-bentonite sprays in field trials against vine *Peronospora* [*Plasmopara viticola*].

Rivera (V.), Sempio (C.), & Shkjezi (A.). **The fungicidal efficiency of urine and the doses to be employed in treatments.**—*Int. Bull. Pl. Prot.*, xviii, 1–2, pp. 1M–7M, 1944. [Received July, 1946.]

The results of preliminary experiments on the fungicidal effects of animal urine showed that inhibition of conidial germination of *Erysiphe graminis* was obtained with urine used 24 hours after being taken and at a dilution of not more than 1 : 2. The addition of calcium (lime) and sulphuric acid together slightly increased the

depressive effects of the diluted urine. The uredospores of *Uromyces appendiculatus* were more susceptible, no germination occurring in dilutions up to 1 : 8, fresh urine appearing less effective than that fermented for seven days. For conidia of *Bremia lactucae* a concentration of 1 : 1 proved inhibitive and one of 1 : 4 (using urine more than one day old) highly unfavourable to germination. Tests on both potted and field vines indicated that dilutions of urine exceeding 1 : 2 do not seriously damage the vegetation; it is hoped to conduct tests on *Plasmopara viticola* later.

Hartsuijker (K.). **Het wetenschappelijk onderzoek van fungicieden.** [The scientific study of fungicides.]—Thesis, Univ. Amsterdam, 143 pp., 1940. [English summary. Received 1946.]

Following a review of the historical development of plant-disease control, especially by means of fungicides, the author describes his laboratory experiments, conducted mostly by McCallan's method [*R.A.M.*, ix, p. 730], to determine the toxicity to the spores of *Venturia inaequalis*, *V. pirina*, *Phytophthora infestans*, *Cladosporium fulvum*, *Septoria apii-graveolentis*, *Ascochyta pisi*, *Helminthosporium sativum*, and *Botrytis cinerea* of (1) hydrated copper sulphate, mercuric chloride, cadmium chloride, hydrated nickel sulphate, and hydrated zinc sulphate; (2) three polysulphides (calcium, ammonium, and barium), calcium monosulphide, and a colloidal bentonite sulphur; and (3) calcium and ammonium polysulphides in combination with powdered lead arsenate and the adjuvants, lime and iron (ferrous) sulphate.

Both copper sulphate and mercuric chloride exerted a powerful fungistatic action on the spore germination of the test organisms, but the latter was the more efficient fungicide of the two. In the case of copper sulphate the threshold of toxicity for *A. pisi*, *B. cinerea*, *H. sativum*, *V. inaequalis*, *V. pirina*, and *P. infestans* lay between 0·0001 and 0·00001 per cent. copper, *B. cinerea* and *H. sativum* being the most resistant; the limits for *C. fulvum* and *S. apii-graveolentis* were above 0·00001 and between 0·00005 and 0·000001 per cent., respectively. For mercuric chloride the threshold of toxicity in respect of *A. pisi*, *B. cinerea*, *C. fulvum*, *V. inaequalis*, and *S. apii-graveolentis* lay between 0·0001 and 0·00001 per cent. mercury, and the values for *V. pirina* and *H. sativum* were little higher, whereas *P. infestans* was more sensitive, the threshold for indirect germination lying between 0·00001 and 0·000001 per cent., while direct germination commenced at 0·00005 per cent. The toxicity of cadmium chloride generally fell below that of copper sulphate and never exceeded it. There were marked discrepancies in the data relating to nickel sulphate, which was the most toxic of all the salts to *B. cinerea* and also exercised a very adverse influence on indirect germination in *P. infestans*. The lower concentrations of nickel sulphate, for some unexplained reason, were more lethal than the higher ones, and a similar relationship was observed with copper sulphate and *B. cinerea*. The toxicity of zinc sulphate to most of the fungi used in the tests was negligible. It did, however, exert a strong preventive effect on indirect germination in *P. infestans*, approximately equal to that of copper or cadmium sulphate.

It is apparent from these results that none of the metallic salts examined can replace copper sulphate as a fungicide, since the equally or more effective mercuric chloride is unsuitable as a spray.

The polysulphides proved to be much more effective both as actual fungicides and as protectants against *C. fulvum* and *V. inaequalis* (the only two tested) than the monosulphide or colloidal sulphur. The use of the two latter, therefore, can only be recommended on sulphur-sensitive plants, to which the polysulphides tend to be phytotoxic. The combination of lead arsenate or lime or iron sulphate with the polysulphides did not materially alter their fungicidal properties, as tested against *C. fulvum*, and hence there is no objection on this ground to their incorporation.

Bailey (D. L.). **Canadian plant pathology in retrospect and prospect.**—*Agric. Inst. Rev.*, i, 1, pp. 41–52, 1945.

This address to the Annual Meeting of the Canadian Plant Pathological Society at Saskatoon on 26th June, 1945, refers to some outstanding past achievements of Dominion plant pathologists and to various urgent problems awaiting attention, concluding with a discussion of the future of the service, especially in relation to the organization, training, and payment of personnel.

Smith (G.). **Presidential address. Mycology and the war.**—*Trans. Brit. mycol. Soc.*, xxix, 1–2, pp. 1–10, 1946.

After noting the increased awareness of, and interest in, mycology during the war, particularly the appreciation of the work of plant pathologists in protecting crops from disease, the author, in this presidential address to the British Mycological Society, discusses notable developments in the protection against fungal attack of industrial goods, particularly those destined for use in tropical climates, and progress in studies of the antibiotic activities of fungi and the industrial development of yeast products.

Miller (P. R.). **Some psychological aspects involved in conducting plant disease surveys : personal bias a factor to be reckoned with in estimating and evaluating plant disease losses.**—*Plant Dis. Reptr*, xxx, 3, pp. 74–77, 1946. [Mimeographed.]

The majority of scientifically minded growers whose aid, based on a rich background of practical experience and local knowledge, is invaluable to plant-disease surveyors, appear to fall into two well-marked groups, one of which tends to exaggerate and the other to minimize the importance of a disease in any given year [cf. *R.A.M.*, xxv, p. 227]. For the carrying-out of surveys on a large scale the institution of a brief course of training for intending participants is suggested, during which standardized trials in the estimation of losses among various crops would be undertaken in fields where actual figures could be determined. The writer believes that surveys have great potential value in securing basic phytopathological information for research- and extension-workers, but issues a note of warning against attaching too great importance to surveys involving only approximations.

Grainger (J.). **Ecology of the larger fungi.**—*Trans. Brit. mycol. Soc.*, xxix, 1–2, pp. 52–63, 1 diag., 5 graphs, 1946.

The author, in this provocative introductory study, shows that most species of the larger fungi have a predilection for acid soils, but there are some which prefer alkaline situations. Mushrooms, for example, have not been found on substrata below pH 5·8. Pronounced disposition to one or other reaction is observed in some genera, notably in coprophilous species, while most humicolous Basidiomycetes need a high average water content in the substrate. As a result of ploughing up, liming, and re-seeding old pasture land near Huddersfield, Yorks., considerable changes in the fungus flora took place and *Russula nigricans* was the sole survivor of eight species, although *Amanita rubescens* was still found on an unploughed headland, to which lime had been added (pH 5·8). Change in water-retention by ploughing is considered to be the determining factor in this elimination from tilled soil. A felling of oaks and beeches in 1942 was followed by the disappearance of *Boletus chrysenteron*, a fungus often found far from woods, and the disturbance of the water content is again regarded as the causal factor.

While *Psalliota campestris* will grow and fruit at any time of year under suitable conditions of climate and nutrition, as do the larger Basidomycetes when grown

in artificial media, natural conditions impose an autumn maximum, governed, it is suggested, by the simultaneous occurrence of a sufficiently high soil temperature, moisture content, and adequate available nitrogen [*R.A.M.*, xxii, p. 103].

Studies of lignicolous fungi showed that *Xylaria hypoxylon* favours wood which is approaching neutrality but only slightly reduced in hardness. *Fomes annosus*, however, grows on wood which retains only 20 to 25 per cent. of its original hardness, but remains fairly acid at pH 5, and two different types of decay may be represented by these examples. The sequence of fungi on fallen logs depends mainly on the stages of decay, but the fungi also contribute to the process. *Trametes mollis* reduced the hardness of wood to about 27 per cent. of its original value, while *F. annosus* caused an 80 per cent. reduction and *Volvaria volvacea* was growing on wood whose hardness was 25 to 32 per cent. of that on which the fungus was not growing.

Moore (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, xxix, 1–2, pp. 90–94, 1946.

The finding of a *Heterosporium* on *Allium* in Sussex by the author and J. R. Booer in June, 1945, is the fourth occasion on which the fungus has been reported in Britain on this host [*R.A.M.*, xiv, p. 423], and was associated with considerable leaf-blotching among autumn-sown White Lisbon onions. The leaves bore one or more elliptical, depressed, pale brown spots, up to 1½ by about ¼ in., enlarging later and, particularly where several appeared on the same leaf, causing the distal portions and the tissues surrounding the spots to become pale or yellow and withered. A pale, powdery agglomeration in the centre of the spot, subsequently developing into a larger brown or deep brown mat, represented the olive-brown conidiophores and pale olive-brown conidia of *Heterosporium*. The conidiophores were more or less rigid, appearing from the stomata singly or in bundles of two or three, mostly septate, nodular, slightly swollen at the tip, and measuring 90 to 120 by 5 to 6 μ. The conidia were verrucose, extremely irregular in size and shape, often unicellular and then usually pyriform, but mostly bicellular and cylindrical, averaging 58 by 16 μ on young spots and 37 to 106 (74) μ long on those showing the maturer brown mat.

While disposed to agree with Jacques [ibid., xxii, p. 179] that small variations in measurements due to age and environmental conditions or the occurrence of *Heterosporium* on different suscepts did not justify the retention of several European varieties, the author concludes that the dimensional differences in *Heterosporium* on onion and other species of *Allium* are so pronounced as to justify provisionally, at any rate, the erection of a varietal distinction between *H. allii* Ell. & Mart. on leek, shallot, chives, and garlic, and the form on onion, for which the name *H. allii* Ell. & Mart. var. *cepivorum* Nicholas and Aggéry [ibid., vii, p. 218] is valid. *H. allii-cepae* Ranojević being a synonym. The variety on leek, *H. allii* var. *allii-porri*, is synonymous with *H. allii*.

A leaf spot of *Helianthemum vulgare* Gaertn. observed by Miss Gooby in July, 1945, on living leaves of pink- and red-flowered (but not on the yellow) hybrids of *H. vulgare* at Harpenden is described and thought to be identical with *Septoria chamaecisti* reported on living leaves of *H. chamaecistus* (*H. vulgare*) in Sweden by Vestergren in 1896. Apparently it has not been observed elsewhere.

Gilbert (W. J.) & Hickey (R. J.). **Production of conidia in submerged cultures of Penicillium notatum.**—*J. Bact.*, li, 6, pp. 731–733, 1946.

The formation of conidia in submerged shake-flask cultures of *Penicillium notatum* [*R.A.M.*, xxv, p. 408] NRRL 832 has been induced in a variety of media, without the addition of heavy metals, under conditions favouring slight or moderate growth, thereby permitting good aeration, and the maintenance of a pH between

5 and 6·5. Submerged sporulation was effected by these means in media supplied with nitrogen by maize steep water, ground or malted wheat, or thin-grain stillage from yeast-fermented wheat mash.

The addition of iron [ibid., xviii, p. 609] to a basal maize steep water-lactose medium at the rate of 100 μgm. per ml. did not materially interfere with penicillin production or promote conidial formation, but at 500 to 1,000 μgm. the mineral suppressed penicillin titres, lowered pH, and stimulated submerged sporulation; at 2,000 μgm. there was marked inhibition of mould growth.

Raper (K. B.) & Fennell (Dorothy I.). **The production of penicillin X in submerged culture.**—*J. Bact.*, li, 6, pp. 761–777, 1 fig., 3 graphs, 1946.

Of several superior penicillin-producing strains investigated, *Penicillium chrysogenum* NRRL 1984.A, a substrain of Minn. R–13, proved to be the most active yielder of chloroform-insoluble penicillin, or penicillin X, in submerged culture [*R.A.M.*, xxv, p. 407]. By ultra-violet irradiation [ibid., xxv, p. 307] a substrain of 1984.A, designated NRRL 1984. N22, was developed, which gave substantially higher yields of penicillin X, generally amounting to roughly 50 per cent. of the total production as measured by differential assays, and representing 65 to 70 per cent. of the total yield on a weight basis.

Stefaniak (J. J.), Gailey (F. B.), Brown (C. S.), & Johnson (M. J.). **Pilot plant equipment for submerged production of penicillin.**—*Industr. Engng Chem.*, xxxviii, 7, pp. 666–671, 2 figs., 3 diags., 3 graphs, 1946.

Equipment for penicillin production in 100-gal. tanks is described. It comprises, besides a tank for producing inoculum and two fermenters, a number of accessory pieces, including a small, cylindrical tank for the measurement of inoculum, anti-foam vessels, air filters, and agitators. By means of this installation, penicillin yields exceeding 200 units per ml. could be reproducibly obtained with *Penicillium chrysogenum* culture NRRL 1951–B25 and 400 with X–1612 (Carnegie) [*R.A.M.*, xxv, p. 408]. An aeration rate of one volume of air per minute per volume of medium was found to be optimal, and agitation was essential. Metal-toxicity tests on *P. notatum* NRRL 832 showed aluminium and Allegheny metal to be non-toxic, whereas a total iron content of 500 μgm. per ml. and upwards in the fermentation medium reduced the penicillin yields in shake flasks.

Stanley (N. F.). **The biological activity of a substance resembling gliotoxin produced by a strain of Aspergillus fumigatus.**—*Aust. J. exp. Biol. med. Sci.*, xxiv, 2, pp. 133–138, 2 graphs, 1946.

The preparation and the biological and chemical properties of aspergillin, an anti-bacterial substance produced by *Aspergillus fumigatus* [cf. *R.A.M.*, xxv, p. 271], are described, the chemical analysis being supplied by J. A. Mills. Evidence adduced from the melting-point, solubility, anti-bacterial activity, lethal dosage for mice, specific rotation, and the chemistry of derivatives of aspergillin points to its close similarity to, if not identity with, gliotoxin [ibid., xxiii, p. 268].

Hyde (H. A.) & Williams (D. A.). **A daily census of Alternaria spores caught from the atmosphere at Cardiff in 1942 and 1943.**—*Trans. Brit. mycol. Soc.*, xxix, 1–2, pp. 78–85, 2 graphs, 1946.

The daily incidence of *Alternaria* spores [*R.A.M.*, xvii, p. 243; xxi, p. 452, *et passim*], believed mainly to have originated on local cereal crops, as determined over the city of Cardiff by counts made on gravity slides, showed a maximum incidence confined roughly to the period June to September, when they may consti-

tute up to 96·5 per cent. of the total. They are practically absent during the autumn and winter. The considerable variations between the daily catches are thought to be influenced by meteorological factors and there is some correlation with maximum temperature, though none apparently with wind velocity. Rainfall sometimes seems to have been responsible for a temporary drop in the number recorded. The rapid fall in September is suggested to be due more probably to removal of the nutritional substratum of the fungus than to the effect of lower temperatures on rate of spore production.

Vicklund (R. E.). **Preventing the fungus fouling of optical instruments.**—*Industr. Engng Chem.*, xxxviii, 8, pp. 774–779, 5 figs., 1 diag., 1 graph, 1946.

The deterioration of optical glass through fungal growth on lenses and prisms, commonly known as 'fungus fouling', constitutes a serious problem in tropical areas. With a view to its control, radium sulphate was incorporated into a metallic foil, which was subjected to mycological and physical tests to determine the fungicidal efficacy and practicability of such a treatment. The organisms against which protection is sought include *Aspergillus niger*, *A. versicolor*, *A. oryzae*, *A. flavus*, *Penicillium citrinum*, *Monilia* [*Neurospora*] *crassa*, *Hormodendrum* sp., *Trichoderma* sp., *Stemphylium* sp., *Mucor* sp., *Spicaria* sp., *Chaetomium globosum*, and *Rhizopus* sp.

The results indicated that radium-activated foil will prevent fungal development on the instruments provided the radium is present in a concentration of 15 μgm. per sq. in. in equilibrium with its decay products. Lenses up to 3 in. in diameter can be adequately protected by surrounding each surface with a strip of foil equal in width to one-ninth of the lens radius. The fungistatic effect of the radium-activated foil was shown to be due to alpha radiation. No risk to health is incurred by the use of transits, binoculars, and the like surrounded by radium-activated foil, and the treatment, though initially costly, is believed to be economically feasible, since subsequent servicing is unnecessary and the foil from worn instruments can be cleaned and re-used.

Marsh (P. B.) & Butler (Mary L.). **Fungicidal activity of bisphenols as mildew preventives on Cotton fabric.**—*Industr. Engng Chem.*, xxxviii, 7, pp. 701–705, 1 fig., 1946.

Biological tests were carried out to determine the fungicidal potency as preventives of mildew (*Metarrhizium glutinosum*, *Chaetomium globosum*, and *Aspergillus niger*) on 8-oz. cotton duck [*R.A.M.*, xxiv, p. 428] of a group of bisphenols and related compounds. The substitution of two chlorine or two bromine atoms for hydrogens in the positions *para* to the phenolic hydroxyls invariably increased fungicidal activity over that observed with the unhalogenated diphenols, but further symmetrical halogen substitution resulted in compounds tending, in some cases definitely, to be less potent than the dihalogen derivatives. Thus, 2,2′-methylenebis (4-nitrophenol) was entirely devoid of measurable fungicidal activity at any of the concentrations tested up to 0·4 per cent., and the same was true of chlorine-substituted derivatives of 2,2′-methylene diphenol in which both phenolic hydroxyls had been blocked by formation of ether linkages. Three- and four-ring compounds containing *para*-cresol or *para*-chlorophenol units joined by methylene bridges were distinctly less effective than the corresponding bisphenols. None of the compounds tested was found to be more fungicidal per unit weight on the fabric than 2,2′-methylenebis (4-chlorophenol) No. 11, known commercially as 'compound G-4', which has been extensively used as a preservative for the last three years.

The various methods of testing the efficacy of mildew-preventives used in these experiments are briefly discussed.

RACE (E.), ROWE (F. M.), & SPEAKMAN (J. B.). **The dyeing of Cotton with mineral khaki. Part VII. The fungicidal and bactericidal efficiencies of Cotton yarn treated by various mineral khaki processes. Part VIII. The incorporation of copper with chromium and iron in mineral khaki for the production of an effective fungicide and bactericide.** RACE (E.) & ROWE (F. M.). **Part IX. The effect of exposure to weathering agencies on yarns pigmented with copper, chromium and iron compounds.**—*J. Soc. Dyers*, lxi, 12, pp. 311–321, 4 figs. (1 col.), 1 diag., 4 graphs, 1945; lxii, 1, pp. 9-29, 10 figs., 18 graphs, 1946.

The following information of mycological interest is selected from the three concluding instalments of this exhaustive study, conducted at the Clothworkers' Research Laboratory and Textile Chemistry Laboratory of Leeds University, on the practice of cotton dyeing with mineral khaki [*R.A.M.*, xxv, p. 132]. The only toxic principle in a chrome iron-treated yarn inoculated with *Metarrhizium anisopliae*, an exceptionally active cellulose-destroyer, was found to be hexavalent chromium, the trivalent chromium and iron components of the compound merely conferring a degree of resistance on the material but not immunity from infection. Even the effects of the hexavalent chromium, moreover, are purely transient, since the chemical is subject to hydrolysis and reduction by cellulose.

In the case of cotton inoculated with a mixed bacterial and fungal culture, the moisture content is an important factor in the nature of the microbiological agents of deterioration, bacteria predominating at 38 to 39 per cent., the lower fungi at 29 to 31, and the latter and Basidiomycetes at 25 to 27. It is important, therefore, in comparative tests, e.g., by the soil-burial and other 'contact' methods, to maintain the moisture content of all the samples at a uniform level. Of the various testing techniques in current use, the usual practice of burying the samples vertically in a considerable amount of soil, with or without an admixture of horse dung, is regarded as inexact, and the writers prefer to place the samples horizontally between layers of prepared horse dung in Petri dishes at a constant temperature of 30° C.

In tests by the foregoing and other methods, including inoculation of the yarn with a pure culture of *Chaetomium globosum* in the presence of a nutrient medium and with free access of air, comparatively small amounts of copper carbonate in conjunction with iron or chromium and iron conferred protection against cellulose-decomposing and other fungi. To ensure optimum results the pigment on the fabric should have a copper content of not less than 0·5 per cent., or in mixtures of copper, chromium, and iron, or copper and iron, minimum total oxide contents of 2 and 1·4 per cent., respectively. The concentration of chromium oxide in the impregnating liquor should not exceed 4·8 gm. (32 gm. chrome alum) per l.

Two series of exposure tests, covering periods of 36 and 12 weeks, respectively, were carried out on yarns proofed with chromium, copper, and iron in different combinations and with various copper compounds, using specially constructed teak frames with 12 wooden pegs along each side to facilitate accuracy and speed. Every fourth week of the first trial, attempts made to culture cellulose-decomposing micro-organisms from the exposed yarns were unsuccessful, indicating that degradation of cotton, free from contamination by soil of other nutriment-providing materials, during exposure in an industrial region, is caused exclusively by weathering agencies. The leaching of chromium from chrome-tinted or mineral khaki-dyed fabric under these conditions is not excessive, and still less iron is lost through exposure, but the reduction in the copper content is extremely heavy. Thus, in the second trial, from 6th November, 1944, to 29th January, 1945, when the pH values of atmosphere, rain, and snow were as low as 3·1, at least 94 per cent. of the original amount of copper disappeared from the yarns treated with cuprammonium hydroxide, copper carbonate, copper-chromium, and copper-iron and 88·3 per cent. from the samples impregnated with copper naphthenate. During the same period the losses in ten-

sile strength of the copper-treated materials were roughly 30 per cent., and it therefore appears unlikely that any of the compounds now used as rot-proofers will withstand lengthy exposures in the acidic atmosphere of English industrial centres.

Milner (M.) & Geddes (W. F.). **Grain storage studies III. The relation between moisture content, mold growth, and respiration of Soybeans.**—*Cereal Chem.*, xxiii, 3, pp. 225–247, 4 graphs, 1946.

The influence of moisture content on the respiratory functions of Illini soy-beans at 37·8° C. was studied at the Minnesota Agricultural Experiment Station by a technique providing for the simultaneous measurement of oxygen consumption and carbon dioxide production, under conditions of continuous and controlled aeration, for periods up to 15 days.

Moisture values below 14 per cent. yielded very low and virtually constant respiratory rates over protracted periods, but small increments of moisture above this point were accompanied by respiratory increases due to mould (principally *Aspergillus flavus* and *A. glaucus*) growth. The latent period of mould spore germination decreased with increasing moisture content. Frost-damaged seeds showed shorter respiratory lag periods and considerably higher respiration rates than did high-grade material at similar moisture levels, as well as a significantly lower critical moisture value than sound seeds. These differences are attributed primarily to the greater concentration and ease of availability of nutrients for mould growth in damaged as compared with healthy seeds. At moisture levels permitting mould proliferation, drastic changes occurred in the chemical composition of the seeds, as estimated by oil acid value and total and reducing sugars. Significant increases in the moisture content of soy-bean seeds maintained in atmospheres of constant humidity in equilibrium with seed moisture were noted in cases of extensive mould growth.

A. glaucus was the most xerophytic of the moulds encountered in these trials, apparently commencing growth at a seed moisture content of 14 per cent., corresponding to a relative atmospheric humidity of 75 per cent. *A. flavus* required a moisture value about 3 per cent. higher for germination. Relative humidity rather than the actual moisture content of the seeds is believed to determine their susceptibility to storage moulds.

Christensen (C. M.). **The quantitative determination of molds in flour.**—*Cereal Chem.*, xxiii, 3, pp. 322–329, 1946.

Of several media tested for the determination of moulds in flour at the Minnesota Agricultural Experiment Station, the best consisted of 20 gm. malt extract, 75 gm. sodium chloride, 20 gm. crude shredded agar, and distilled water to make up to 1 l. *Aspergillus candidus*, *A. glaucus*, and other common and abundant occupants of flour make rapid growth on the substratum (pH 5), the high salt concentration of which entirely inhibits bacterial development. A higher mould count is obtained from a given sample on the malt-salt medium if the flour is suspended in sterile saline solution, and this suspended in the agar, than if it is similarly suspended and cultured on the surface of the medium or spread dry over the latter.

Cathcart (W. H.). **High frequency heating produces mold-free bread.**—*Food Industr.*, xviii, 6, pp. 98–99, 3 figs., 1946.

Mould growth in wrapped, sliced bread was experimentally shown at the National Bakery Division Laboratory, the Great Atlantic and Pacific Tea Co., New York, to be preventable by through-heating with electric current at frequencies of approximately 15 megacycles, using a 3-kw. output radio-frequency unit, with an input of 5 kw., an overall efficiency of 55 per cent., and a possible power factor of slightly

above 90 per cent. The treatment raised the temperature of a 20-oz. loaf from that of the room to the 140° F. necessary to ensure sterility in 50 seconds, and no mould developed in three weeks' subsequent storage at room temperature.

LINDEBERG (G.). **Thiamin and growth of litter-decomposing Hymenomycetes.**—*Bot. Notiser, 1946*, 1, pp. 89–93, 1946.

Most of the Swedish litter-decomposing Hymenomycetes [see next abstracts] included in this study on the influence of thiamin on growth were shown to be heterotrophic in respect of the vitamin, among those reacting most favourably to its admixture with the nutrient solution at a dosage of 50 γ per l. being *Clavaria ligula*, *Collybia ambusta*, *Flammula penetrans*, *Mycena vulgaris*, and *Pholiota mutabilis*. The dry weight of the mycelium (in mg.) of these species was raised from 0·7 to 115·4, 1 to 110·2, 0·5 to 109·1, 1·3 to 193·1, and 2·1 to 134·3, respectively, by the growth substance. *Clitocybe geotropa* and *Hypholoma fasciculare* produced, respectively, 5·1 and 7·4 mg. mycelium without the addition of thiamin, and it may therefore be assumed that they are to some extent auxo-autotrophic in this respect, though insufficiently so for optimum development.

MELIN (E.). **Der Einfluss von Waldstreuextrakten auf das Wachstum von Bodenpilzen, mit besonderer Berücksichtigung der Wurzelpilze von Bäumen.** [The influence of litter extracts on the growth of soil fungi, with special reference to the root fungi of trees.]—*Symb. bot. upsaliens.*, viii, 3, 116 pp., 40 graphs, 1946. [English summary.]

Extracts were prepared from the dead leaf and needle litter of *Acer platanoides*, birch (*Betula verrucosa*), beech, Scots pine (*Pinus sylvestris*), aspen (*Populus tremula*), oak, and elm (*Ulmus glabra*) [see preceding and next abstracts], and from the straw and foliage of *Glyceria maxima* [*R.A.M.*, xxiv, p. 472] and tested for their effects on some mycorrhizal fungi of conifers, viz., *Boletus elegans*, *B. granulatus*, *B. luteus*, *B. variegatus*, *Lactarius deliciosus*, *Paxillus prunulus*, *Rhizopogon luteolus*, *R. roseolus*, and *Tricholoma imbricatum*; the non-mycorrhiza-forming *M[ycelium] r[adicis] atrovirens*, which commonly occurs as a parasite in forest tree roots [ibid., xxi, p. 390; xxiv, p. 464]; and the saprophytes *Morchella conica*, *Psalliota arvensis*, *Clavaria dendroidea*, *C. flaccida*, *C. gracilis*, *C. ligula*, *Clitocybe infundibuliformis*, *C. geotropa*, *Collybia dryophila*, *Mycena epipterygia*, and *Stropharia aeruginosa*; while *Phycomyces blakesleeanus* [ibid., xxiii, p. 311] was included for comparative purposes.

All the types of litter contained water-soluble substances promoting in varying degrees the mycelial development of the thiamin-heterotrophic species tested, i.e., the mycorrhizal Hymeno- and Gasteromycetes and the litter-decomposing Hymenomycetes. In general, the relative growth increase in the mycorrhizal organisms ranged from 150 to 300 per cent., but even larger increments were occasionally obtained, notably in the case of *L. deliciosus*, the production of which reached a maximum of 60 times that of the controls without extract. The litter-decomposing Hymenomycetes were also benefited in a striking manner by the extracts. *R. luteolus* and *R. roseolus* in particular responded to minute quantities; the maximum stimulus, however, was usually exerted by additions of 10 to 20 mg. (dry substance) per ml. medium.

The fungi varied in their reactions to the ash constituents of the litter extracts, the growth of *B. variegatus* A and *Clavaria dendroidea*, for instance, not being promoted at all, while *R. luteolus* and *R. roseolus* responded feebly, and the stimulus afforded to *B. variegatus* B, *B. granulatus*, *B. luteus*, and *L. deliciosus* was considerable. The lower limit of the growth-promoting effect of the ash constituents of aspen leaf litter was 0·001 per cent. or less, a peak generally being reached between 0·01 and 0·2 per cent. As already indicated by Lindeberg's experimental results

and those (unpublished) of Birgitta Norkrans, the stimulatory property of the litter resided in its calcium and manganese content, probably supplemented by one or more growth substances which expedited the development of the test fungi [see preceding abstract], including the parasite *M.r. atrovirens*.

Particular interest attaches to the experiments on *B. variegatus* A and *C. dendroidea*, which represent two distinct types of growth response, the amount of fungus substance produced by the former being out of all proportion to the suboptimal supplement of litter extract, whereas in the latter species the increment was in reasonable relation to the accessory factor. There is cogent circumstantial evidence that the content of the litter extracts includes, besides known growth substances such as thiamin and biotin, one of unknown identity found by Robbins (*Amer. J. Bot.*, xxvi, 1939; xxvii, 1940; *Bot. Gaz.*, ci, 1939; cii, 1941) and Robbins and Hanmer (*Bot. Gaz.*, ci, 1940) to promote the development of *P. blakesleeanus* and named by them factor Z. Response to this substance was of two different types, (1) the *Phycomyces* type, characteristic of *P. blakesleeanus* and most of the other fungi tested, consisting in a more or less marked acceleration of the growth rate, though satisfactory development was made without the supplementary factor; and (2) the *Clavaria* type, represented by *C. dendroidea*, which made only insignificant growth in the absence of Z, at any rate in the early stages. No evidence was obtained to support the assumption of Robbins and Kavanagh (*Proc. nat. Acad. Sci., Wash.*, xxviii, 1942) and Robbins (ibid., xxix, 1943) that factor Z is identical with hypoxanthin.

A. platanoides, birch, beech, oak, aspen, and pine leaves also contained water-soluble substances inhibiting or preventing the growth of certain soil Hymenomycetes, notably the mycorrhiza, the litter-inhabiting and decomposing species being impervious to their influence. The physical and chemical properties of these antibiotic principles have not yet been fully studied. Autoclaving the cold water extracts at 120° C. resulted in some cases in an intensification of their inhibitory properties, in respect both of the mycorrhizal and litter-decomposing fungi; this effect was particularly noticeable in the tests with *A. platanoides* litter extract. The aqueous extract of *G. maxima* did not impede the growth of any of the experimental fungi.

Melin (E.) & Wikén (T.). **Antibacterial substances in water extracts of pure forest litter.**—*Nature, Lond.*, clviii, 4006, pp. 200–201, 1946.

As a result of testing cold water extracts of pure litter of Swedish forest trees [cf. *R.A.M.*, xxiii, p. 220 and preceding abstracts] of the species *Acer platanoides*, birch (*Betula verrucosa*), beech, ash, aspen, oak, and elm (*Ulmus glabra*), for antibacterial properties against *Staphylococcus aureus* No. 266 in the light of the senior author's previous findings, only *A. platanoides* and, to a lesser extent, oak were found to contain antibiotic agents effective against the pathogen under the assay methods used.

Winge (O.). **Croisement inter-spécifique chez les champignons.** [Interspecific hybridization among fungi.]—*Sci. genet.*, ii, 2–3, pp. 171–189, 9 figs., 1942. [Latin, English, and German summaries. Received August, 1946.]

In studies of hybridization in fungi it is important to differentiate between (*a*) hybrids composed of cells containing specifically distinct, haploid nuclei which have not fused (dicaryophytic species hybrids), and (*b*) hybrids resulting from the fusion of specifically different, haploid nuclei to form a diploid hybrid nucleus (true species hybrids).

Various experiments on fungal hybridization from the relevant literature are discussed, and the conclusion is reached that very few true species hybrids are known.

Fries (N.). **X-ray induced parathiotrophy in Ophiostoma.**—*Svensk bot. Tidskr.*, xl, 2, pp. 127–140, 1946.

Out of 94 X-ray-induced physiological mutations of *Ophiostoma multiannulatum* [*Ceratostomella multiannulata*: *R.A.M.*, xxv, p. 133], 13 were parathiotrophic, i.e., incapable of assimilating hexvalent sulphur (as sulphate or sulphone). Among compounds containing bivalent sulphur, cystein and cystin served as valuable sources of sulphur for the mutants, while sodium and ammonium sulphides and tri-methyl-sulphide-metan were also assimilable. It appeared from mating experiments that the reduction of sulphate in *C. multiannulata* is controlled by at least three distinct genes. Five of the parathiotrophic mutants were capable of reversion to the normal state of euthiotrophy in a medium with sulphate as the sole source of sulphur.

Fron (G.) & Magrou (J.). **Le problème de la Pomme de terre.** [The Potato problem.]—*C. R. Acad. Agric. Fr.*, xxvi, 22, pp. 809–824, 1940. [Received August, 1946.]

In 1938 Magrou, starting with uninfected seeds growing in a nutrient solution, obtained the formation of potato tubers on some of the plants in the absence of symbiotic mycorrhiza [*R.A.M.*, xxiv, p. 332]. Further experiments showed that tuberization depended on a certain minimum of sugar in the medium. In further *in vitro* work, Magrou germinated aseptic potato seeds and in three or four months they produced young plants with asymbiotic, primary tubers. Planted at once in soil rich in mycorrhiza, these gave plants which, protected from all further infection, the following summer gave secondary symbiotic tubers. Replanted the following March in ordinary conditions, they yielded an abundant crop. Thus, from one aseptic seed in 18 months (using symbiosis) a harvest of 83 tubers weighing over 10 kg. was produced.

Magrou and his co-workers have (1940) in their laboratory at the Pasteur Institute 30,000 tubes, each sown with 5 or 6 seeds. If only one-tenth give primary tubers and these can be planted in soil containing suitable mycorrhiza several tons of seed potatoes more likely to be free from degeneration diseases than any others could be obtained. It is claimed that genetically selected strains can be tried out much more rapidly by this method.

Magrou states that, using the symbiotic cultivation of potatoes in the Pyrenees, sowings give 26 to 64 tubers per stool. These primary tubers, replanted in the same mycorrhiza-containing soils, provide abundant 'seed' of exceptional quality.

To apply in practice and on a large scale the symbiotic method, the uncultivated districts of France rich in plants showing mycorrhiza should be selected. Test plantings should be made, and where the location seems favourable primary tubers should be planted in unmanured ground. This will give an abundant crop of seed tubers in the second year. If the work is done at a distance from any other potato field the risk of virus disease will be reduced to a minimum.

The use of aseptic primary tubers raised from seeds in glucose solution will eliminate the remotest risk of virus contamination if when planting in the fields containing mycorrhiza protection is given against insects; or early plantings could be made in Mediterranean areas and harvested before the insect vectors of virus diseases appeared.

Gigante (R.). **Esperienze d'orientamento sulla 'maculatura ferruginea' dei tuberi di Patata.** [Exploratory experiments on rust spot of Potato tubers.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 3, pp. 189–204, 3 figs., 1940. [Received June, 1946.]

'Maculatura ferruginea' [Eisenfleckigkeit = internal rust spot] of potato tubers [*R.A.M.*, xv, p. 249] in some years causes serious losses in Italy [ibid., xxv, p. 439],

where it is sometimes exceptionally severe on the varieties Pepo and Parnassia. From numerous inspections of affected potato fields it appeared that the disease followed on the planting of affected tubers.

To test the possibility of tuber transmission affected Parnassia tubers from the vicinity of Como were cut in half (to make sure they were affected) and the halves planted in separate holes. Nine plots of 100 holes each were planted to affected half-tubers and one to apparently unaffected half-tubers derived from affected plants. Of the nine plots one was left untreated as a control; the other eight had been treated as follows: manganese sulphate (3 gm. per sq. m.), sodium tetraborate (3 gm.), potassium chloride (5 gm.), powdered sulphur (100 gm.), lime (100 gm.) plus calcium superphosphate (40 gm.), lime (100 gm.), iron sulphate (5 gm.), and gypsum (50 gm.). Planting was carried out in April, 1940. In the vicinity of Rome where the first set of experiments was carried out the soil was argillaceous, very compact, and neutral. Growth was excellent and no sign of disease appeared on any plant. In August the potatoes were dug. The untreated control plot, the plot with apparently healthy half-tubers, and those given the treatments listed above then showed, respectively, 60, 57, 50, 50, 54, 60, 64, 49, 55, and 50 per cent. internal rust spot.

The same experiment at Avellino in south Italy (volcanic soil, pH 7·2, 380 m. above sea-level) gave a percentage of affected tubers derived from diseased half-tubers of 62 to 65, and from apparently healthy half-tubers from 50 to 55. At Trento in north Italy (light, sandy soil, neutral reaction, 200 m. above sea-level), the corresponding figures were 5 to 7 and not over 2 per cent.

It is concluded that internal rust spot is unquestionably transmitted through affected seed pieces. It is also stated to be transmissible by apparently healthy tubers obtained from plants that have given affected tubers.

Holmberg (C.). **Potatiskräfta och Potatisål i Sverige år 1945.** [Potato wart and Potato eelworm in Sweden in the year 1945.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 2, p. 28, 1946.

During 1945 potato wart [*Synchytrium endobioticum*] was reported from 118 allotments distributed over 35 parishes in 11 provinces of Sweden [cf. *R.A.M.*, xxv, p. 137], 18 of the new foci originating in eight districts hitherto free from the disease. The province of Scania harboured most of the new cases, with Kristianstad as the main reservoir of inoculum, whence 183 fresh outbreaks were recorded from 1941 to 1945, as compared with 98 from 1928 to 1940.

Holmberg (C.). **Fortsätta fältförsök rörande Potatiskräftans bekämpande.** [Continued field experiments on Potato wart control.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 1, pp. 13–14, 1946.

Further experiments in Sweden to determine the duration of persistence in the soil of the potato-wart fungus [*Synchytrium endobioticum*: *R.A.M.*, xxv, p. 136 and preceding abstract] generally confirmed those already obtained. The inoculum apparently dies out with the protracted cultivation of immune varieties or non-susceptible kitchen-garden crops, whereas it was still infective after 16 to 17 years in ground allowed to revert to grass.

Lutman (B. F.). **The spread of Potato scab in soil by Potato plant humus.**—*Bull. Vt agric. Exp. Sta.* 528, 40 pp., 12 figs., 1945.

The belief that potato scab (*Actinomyces chromogenus*) [*A. scabies*] [*R.A.M.*, xxv, p. 356] is spread by infected tubers is considered to have cost growers millions of dollars in uselessly disinfecting seed [ibid., xxiii, p. 508]. The Actinomycetes in the soil have been shown to come from mycelium or resting spores in the decaying plant remains. Where, therefore, the soil is known to favour the growth of the

pathogen all potato plants should be removed, even at the expense of the humus. As far as is practicable, the tops should be removed for manuring other crops.

The vertical stems of potato plants from plots infected by *A. scabies* showed typical browned and cracked scab lesions, and many lenticels on the white stolons which terminated in badly scabbed tubers were brown, slightly enlarged, and elongated. Young potato roots, at first white, soon develop brown spots of varying sizes located in the cortex. Some cell walls in the tangential and cross sections of the roots were browned and swollen and appeared to enclose pigment-excreting filaments which are the same as those in the skin of young tubers near young scab lesions and are undoubtedly growths of chromogenic Actinomycetes [loc. cit.]. The structure of all cortical cell walls was complex, but only a few had the brown discoloration.

Actinomycetes were isolated from soil and humus by using a differential medium of pectin, arabinose, and inorganic salts with a pH of 5·6 (rendering the pectin unavailable except to a few bacteria), used either as a liquid or as a gel by incorporating 0·5 per cent. agar. *Actinomyces* germ-tubes developed invariably from within thoroughly disintegrated potato plant particles from two- to seven-year-old compost. No conidia or conidial germ-tubes were seen. In a few cases germination seemed to have occurred at both ends of a short mycelial thread. Where similar germinations were secured from finely powdered potato leaves composted the previous year, the fragments were still recognizable as plant cells, but it was not possible to determine with any accuracy the origins of the germinating hyphae which grew from them. The presence of Actinomyces hyphae of different diameters suggested the occurrence of more than one species within the plant.

Germination of *A. scabies* was poor until the soil temperature rose from 16° to 18° C. during the first week in June, and the number germinating increased until mid-July, when a fall in the moisture content of the soil to some 6 per cent. of its dry weight, owing to drought, almost stopped the growth of the pathogen; nor did heavy rain later re-establish the rate or number of germinations for several weeks, after which germination went on until December.

The recovery of immense numbers of *A. scabies* per gm. of soil samples preserved for seven years in glass-stoppered bottles, where the soil contained a high percentage of humus and still remained moist, indicated the persistence of the organism in the soil. Potato humus was shown to contain 46 per cent. moisture at a time when soil moisture was only 23 and to be definitely alkaline in reaction by reason of a high population of *A. albus*. It would thus be likely to encourage scab. Soil (pH 6·4) entirely free from *A. scabies* was inoculated with a compost of potato residues of preceding years from badly diseased plants. Tubers planted in this soil developed scab much more severely than those grown in uninoculated soil. It is concluded that a source of infection is provided by *A. scabies*, inhabiting the soil in humus derived from parts of the potato plant other than the tubers.

Lhoste (L.). **À propos de la fusariose de la Pomme de Terre.** [On fusariosis of Potato.]—*Rev. hort., Paris*, N.S., xxx, 6, pp. 103–104, 4 figs., 1946.

This brief, popular note on dry rot of potato (*Fusarium caeruleum*) concludes with the conventional recommendations for securing resistant varieties, interim control measures by careful avoidance of mechanical injury, and storage and sack disinfection with formalin, concentrated solutions of which (15 to 20 per cent.) are necessary for the destruction of the spores [cf. *R.A.M.*, xxv, p. 315].

Gum (O. B.), Brown (H. D.), & Burrell (R. C.). **Some effects of boron and manganese on the quality of Beets and Tomatoes.**—*Plant Physiol.*, xx, 2, pp. 267–275, 2 figs., 1945.

A procedure is outlined suitable for the growth and analysis of crops to determine the effects on quality of various boron and manganese treatments. Data are

given on the effect of boron and manganese deficiencies on the dry matter, reducing and total sugars, alcohol-soluble nitrogen, insoluble nitrogen, and vitamin content of tomatoes and beets. The controls showed slightly more vitamin B_2 than boron- or manganese-deficient plants of both hosts, while only a trace of vitamin B_1 was found in either.

Hunter (J. G.) & M'Gregor (A. J.). **Some abnormalities in the nutrition of crops.**—*Scot. J. Agric.*, xxvi, 1, pp. 30–33, 1946.

This report on crop failures in the West of Scotland Agricultural College area supplements an early one [*R.A.M.*, xxiv, p. 467]. It is recommended that extremely acid soils planted to oats and potatoes should receive lime dressings, particularly on light soils and where calcium deficiency occurs owing to omission of lime applications. Top-dressings of hydrated lime applied to young plants induced considerable improvements. Magnesium deficiency seems more widespread than suspected hitherto, notably in the counties of Ayr, Dumbarton, Lanark, Renfrew, Stirling, and west Perth, and in less acid as well as in very acid soils. In acid soils treatment with dolomitic limestone or magnesium marl, applied sufficiently long before sowing to allow of full absorption, should remedy this deficiency. Some potatoes appear particularly susceptible to it, and may require more magnesium than other crops. In the counties of Dumbarton, Lanark, Renfrew, and Stirling swede and oat crops on acid soils showed abnormalities and failure coincidental with the presence in the crops of unusually high manganese concentrations [ibid., xxv, p. 197]. The condition was accompanied by an abnormally high concentration of water-soluble manganese in the soil, and is considered to be due to soil acidity.

Borzini (G.). **Primo contributo allo studio delle possibilità di una coltivazione artificiale del 'Fomes officinalis' (Will.) Fr.** [A first contribution to the study of the possibilities of an artificial cultivation of '*Fomes officinalis*' (Will.) Fr.] — *Boll. Staz. Pat. veg. Roma*, N.S., xxi, 3, pp. 221–234, 4 figs., 1941. [Received June, 1946.]

Owing to the impossibility of importing *Fomes officinalis* (used for medicinal purposes) [*R.A.M.*, xxiv, p. 472] into Italy during the war the author undertook an investigation into the artificial cultivation of the fungus. A few specimens were found in Val di Sole in the Alpine regions of Italy, at an altitude of about 2,200 m., on the trunks of old larches in poor condition, and occasionally on dead, felled larches.

Fragments of mycelium found under the bark were transferred to potato dextrose agar or the same mixed (before sterilizing) with larch wood sawdust. At 22° to 24° C., colonies began to form after seven or eight days. Transfers were then made on to other media (carrot agar plus dextrose decoction of larch wood, potato dextrose agar plus larch wood decoction, etc.). In agarized larch wood decoction fungal development was almost inhibited at a pH near to or above 6. The addition of a high proportion of larch wood decoction to carrot or potato dextrose agar favoured growth. Development was very satisfactory and the amount of mycelium greatest on larch wood sawdust (pH 4·7). The addition of agar increased the aerial mycelium. On larch wood cylinders the fungus grew readily.

The most successful way to grow the fungus artificially will probably be to inoculate sickly larches with various types of cultures, or to use felled larches or other resinous or even broad-leaved trees. Further studies are in progress.

Martin (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1944–5* (ex *Printed Reps. Hawaii Sug. Pl. Ass., 1945*), pp. 23–30, 1946.

The six canes sent for testing to Queensland in 1939, namely, 28–4291, 31–2484, 31–2806, 32–1063, 32–3575, and 32–8560 [cf. *R.A.M.*, xxiv, p. 432], proved very

susceptible to Fiji disease. The effect of hot-water treatment on the disease was tried out by A. F. Bell in Queensland. Satisfactory germination occurred after treatment at 55° C. for 20 minutes, but the shoots came up 100 per cent. diseased; 20 minutes' exposure to 56°, 60°, and 62° killed all the buds.

Eye spot [*Helminthosporium sacchari*], mosaic, and root rot [? *Pythium graminicola*] are now considered of secondary importance in Hawaii and the current commercial varieties have shown themselves robustly resistant to them. An eye-spot lesion is rarely found on 32–8560, which is grown on what were formerly areas harbouring this disease. Varieties 32–8560 and 32–1063 have shown not a single case of mosaic. These and other varieties are highly resistant to root rot. Chlorotic streak and leaf scald have also declined in virulence during recent years. Several varieties susceptible to leaf scald [*Xanthomonas albilineans*], such as 28–4291, Yellow Caledonia, and 29–3859, have been replaced with resistant sorts. Potash deficiency was noted in isolated areas of Hawaii on 32–1063, 32–8560, and 31–2484 as they approached maturity.

C. W. Carpenter reports that as a result of inoculating common prickly pear with a variety of *Fusarium oxysporum* [ibid., xxiv, p. 109] the density of the cactus has been sufficiently reduced to allow about 1,000 acres on the Parker Ranch, Hawaii, to be made accessible to cattle. Only the red-fruited variety appears to be susceptible. As this disease does not spread noticeably, it is unlikely that this practice will inconvenience those ranchers who value the cactus as a source of water and feed for their cattle during droughts. In neither the spineless cactus (*Opuntia ficus-indica*) nor in the night-blooming *Cereus* (*Hylocereus undatus* [*Cereus grandiflorus*]) does the disease develop progressively following inoculation. A technique has been developed whereby one man can inoculate several hundred clumps of cactus daily.

In the course of studies, undertaken in co-operation with C. W. Carpenter, concerning the basic nutrient solution for penicillin production, D. M. Weller has shown that when pure dextrin and dextrose were substituted for and in combination with glucose in the solution, the medium containing dextrin was far superior for penicillin production. When lactose was compared with dextrin similar yields of penicillin were obtained, but after 270 days under refrigeration the titre of the lactose medium held up better than that of the dextrin medium. As additional amounts of sulphur dioxide (one of the impurities in glucose syrup) were added to the glucose media, penicillin production decreased accordingly.

Cross (W. E.). **La actuación de la Estación Experimental frente a la crisis producida por el 'carbóne' de la Caña de Azucar.** [The action taken by the Experiment Station in face of the crisis produced by the Sugar-Cane 'smut'.]—*Circ. Estac. exp. agríc. Tucumán* 136, 7 pp., 1946.

This is a summary of the steps taken by the Tucumán Agricultural Experiment Station to overcome the crisis in the Argentine sugar industry occasioned by the outbreak of smut [*Ustilago scitaminea*] in 1943—the most formidable threat to production since the mosaic epidemic of 1916. Lists are given of the immune and resistant varieties already recommended [*R.A.M.*, xxv, p. 183], with the acreages under each according to the latest available data.

McMartin (A.). **Chemotherapy in the propagation of Sugarcane.**—*S. Afr. J. Sci.*, xlii, pp. 122–130, 2 figs., 1946.

The writer recapitulates the results of his experiments in the control of pineapple disease of sugar-cane (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) in South Africa by chemotherapy, which have already been noticed from other sources [*R.A.M.*, xxvi, p. 279].

Tobisch (J.). **Beiträge zur Kenntnis der Pilzflora von Kärnten. VI.** [Contributions to the knowledge of the fungus flora of Carinthia.]—*Öst. bot. Z.*, xci, 2–3, pp. 184–189, 1942. [Received August, 1946.]

Most of the species comprised in this final instalment of the writer's annotated list of Carinthian fungi [cf. *R.A.M.*, xviii, p. 57] are Basidiomycetes, several of which are new records for the region. Mention may further be made of *Ascochyta juglandis* on walnut [ibid., xix, p. 309], not hitherto reported from Carinthia.

Dietel (P.), Eichhorn (E.), & Poeverlein (H.). **Die Rostpilze Kärntens.** [The rust fungi of Carinthia.]—*Öst. bot. Z.*, xcii, 1–2, pp. 50–86, 1943. [Received August, 1946.]

This compilation of Carinthian rusts is based on material collected by the authors on three visits to the Austrian province, supplemented by a perusal of the relevant literature.

Wang (M. C.). **Manual of the plant diseases of Honan Province.**—61 pp., Honan Univ., (?) 1942. [Received 1946.]

This is a list, with an introduction and annotations in Chinese, of the fungal, bacterial, and virus diseases of plants in Honan Province, arranged in alphabetical order under the scientific names of the hosts. A bibliography of 44 titles is appended.

Simpson (Muriel W.) & Talbot (P. H. B.). **An enumeration of fungi collected at Qudeni Forest Reserve, Zululand, in February, 1945.**—*S. Afr. J. Sci.*, xlii, pp. 131–134, 1946.

This is believed to be the first list of fungi from the Qudeni Forest Reserve, Zululand. It consists largely of Basidiomycetes, represented for the most part by Polyporaceae, with a few Ascomycetes.

Raestad (Randi). **The relation between Polyporus abietinus (Dicks. ex Fr.) Fr. and Irpex fusco-violaceus (Ehrenb. ex. Fr.) Fr.**—*Nyt Mag. Naturv.*, lxxxi, pp. 207–231, 1 fig., 2 diags., 1941. [Received September, 1946.]

Polystictus (*Polyporus*) *abietinus* and *Irpex fusco-violaceus* [*R.A.M.*, v, p. 267; xxii, p. 186] are generally regarded as identical by American authors, whereas in Europe it is customary to maintain a distinction between them. In the author's studies at Oslo University, to elucidate the taxonomy of the species, all pairings between Norwegian strains of identical morphology were interfertile, whereas none of those between the typical *Polystictus abietinus* [ibid., xx, p. 613] and the fungus known in Norway as *I. fusco-violaceus* formed clamp-connexions. This intersterility, coupled with constant divergences in hymenial morphology and anatomy and differences in the growth rates and natural substrata, *P. abietinus* occurring on pine, spruce, fir (*Abies*), and larch and *I. fusco-violaceus* on the last-named only, would appear to corroborate the view that the species are distinct, though very closely related in respect of many important features. However, a comparative study of Norwegian and North American specimens (from Canada and the United States) led to a different conclusion. The American material comprised a far larger number of forms and types than are found in Norway, or probably elsewhere in Europe. Some of the American forms are true intermediates between the Norwegian *P. abietinus* and *I. fusco-violaceus*, while others differ, both in size and hymenial morphology, from the strains collected in Norway. The fact that American and Norwegian isolates (both poroid and lamellate) are entirely interfertile is considered to demonstrate that the two European fungi, connected by the American types, are members in a chain of closely related forms belonging to one and the same species.

Discussing the revision in the nomenclature of the species necessitated by this concept, the writer accords priority to De Candolle's name of *Polyporus abietinus*

Fr. (1830), which should be subdivided, at any rate as regards the European forms, into two subspecies, viz., *euabietinus*, corresponding to the Friesian species, *P. abietinus*, and *fusco-violaceus*, agreeing with Fries's description of *I. fusco-violaceus*. The comparatively homogeneous forms of the fungus occurring in Europe have been exhaustively investigated by Donk (*Meded. ned. mycol. Ver.*, xxii, 1933), and his diagnoses of *Hirschioporus abietinus* (Dicks. ex Fr.) Donk and *H. fusco-violaceus* (Ehrenb. ex Fr.) Donk might well be applied to *P. abietinus* subsp. *euabietinus* and *P. abietinus* subsp. *fusco-violaceus*, respectively.

Dennis (R. W. G.). **Notes on some British fungi ascribed to Phoma and related genera.**—*Trans. Brit. mycol. Soc.*, xxix, 1–2, pp. 11–42, 3 pl., 3 figs., 1946.

In a series of experiments with 34 strains of fungi ascribed to *Phoma* and cognate genera, the author has sought to clarify the confusion arising from the many names applied to pycnidial fungi with colourless, unicellular spores, associated with minor *Phoma* rots of potato, and to remove some of the difficulties occasioned to plant pathologists thereby in determining the causes of these disorders.

Preliminary isolations showed three types of culture, considered to represent distinct species of *Phoma*, commonly obtainable from British potato tubers, all being non-aggressive parasites, possibly soil-inhabiting and not specialized to any particular host. A collection of *Phoma* species was made during 1944 from herbaceous plants in south-east Scotland to compare with these. Morphological, cultural, and physiological characters and degree of pathogenicity were employed as criteria in classifying the 34 isolates into 17 groups, the nomenclature adopted being that of Grove [*R.A.M.*, xv, p. 53]. Potato tubers (Doon Star), swede roots, tomato stems, tomatoes, and apples (Ben's Red) were used for inoculation.

Group I, referred to *P. foveata*, contained only one strain [ibid., xx, p. 91], although the spore measurements are somewhat larger. This strain caused button-like or small gangrene lesions on Doon Star tubers.

Of the nine strains used to constitute Group II, isolated from potato and a variety of wild plants, some are at present classifiable as *Phoma* or *Phyllosticta* and others as *Diplodina* or *Ascochyta* on the basis of spore septation, but otherwise they appear to be closely related, forming a natural group. All these strains produced similar localized lesions on swede roots, all attacked apples, some locally, but others produced a slow brown rot, and all caused rapid rot of green tomatoes and stem canker, lethal with six strains. Group II is differentiated from *Diplodina* [*Didymella*] *lycopersici* by the appearance of the cultural mat, the presence of stilboid bodies in the latter, and the different reaction on potato tubers, and while strains of group II can attack healthy leaves of young and vigorous tomato plants, they are much less aggressive than *D. lycopersici*, infection by which the tomato is unable to localize. Strain 2 is thought to represent *Phoma tuberosa*, strain 3 *P. solanicola*, strains 4 and 5 and possibly 6 may be Saccardo's *P. herbarum*, strain 7 *Diplodina sonchi*, strain 10 *Phyllosticta lonicerae*, while 8 and 9 suggest the pathogen described by Pethybridge *et al.* [ibid., i, p. 175] as responsible for a 'foot rot' of flax in Ireland and best accord with the description of *Ascochyta linicola* Naoumov & Vassilievski.

Group III was represented by strain 11 only, isolated from a tomato stem and identified as *Didymella lycopersici*. It readily attacked potato tubers [ibid., xxiv, p. 90] and liquefied gelatine to a depth of 5 and 16 mm. in 15 and 30 days, respectively. No pycnidia matured in agar cultures but developed readily on sterilized potato plugs and on inoculated tomato stems. Septation occurred in about 24 per cent. of the spores. The writer was not able to obtain an authentic strain of *Phoma destructiva* for comparison.

Group IV contains one strain only, from living ivy leaves. Strain 13 (group V) formed lesions on Doon Star tubers and apples and it rotted green tomatoes. It

appears to conform most closely to the description by Wollenweber and Hochapfel [ibid., xvi, p. 105] of *P. aceris-negundinis*. Strain 16 from living gooseberry leaves in group VI is classed as *Phyllosticta grossulariae*, and 14 and 15 are considered to be identical with it. Groups VI, VII, VIII, IX, and X were non-parasitic to all experimental hosts, except that strains 17 and 18 (group VII) developed minute lesions on apple fruit. Strain 18 has been identified as *Phoma eupyrena*. Strain 19, the only representative of group VIII, is referred to *P. complanata*; strain 20 of group IX is *P. acuta*, and the remaining strains of this group, nos. 21 to 24, are closely allied to it, all being widespread on dead herbaceous stems. Strain 26 of group X was accepted by Grimes [ibid., xii, p. 24] as probably *P. hibernica*, yet is very like Grove's material of *P. oleracea*, while 25 seems to be *P. urticae*. Strain 28, group XI, is *P. nebulosa*, found on the upper part of dead nettle (*Urtica dioica*) stems, and usually side by side with *P. urticae*. Strain 29, group XII, isolated from a dead figwort (*Scrophularia*) stem, is a form of *P. oleracea* [*P. lingam*], and strain 30, group XIII, bore some resemblance to strain 29 recorded by Grove as *P. oleracea* var. *scrophulariae*. Strain 31 from goosegrass (*Galium aparine*), constituting group XIV, is probably identical with *Diplodina galii*, collected by Grove on *G. mollugo* in Cornwall. It produced on apples lesions only, no rot. Group XV (strain 32) from a pycnidium on a gooseberry twig had the smallest spores of all the strains investigated, produced small lesions on apples, and is identical with Grove's fungus *Ascochytella grossulariae*. Strain 33, group XVI, obviously a form of *P. lingam*, produced a rapid rot of swede, and strain 34, group XVII, Brooks and Searle's original isolation of *P. alternariacearum*, is, according to Wollenweber and Hochapfel, a synonym of *P. glomerata*.

The author found the delimitation, suggested by Wollenweber and Hochapfel, as *Phoma* species those with less than 5 per cent. septate spores and as *Ascochyta* those with more than 50 per cent., difficult to follow in practice, many strains, groups II and III in particular, being intermediate forms. While, however, the confusion of nomenclature as shown by this study exists and the species are so little known no more logical classification can be attempted.

HUGHES (S. J.). **An undescribed species of Chaetomium, with four-spored asci.**—*Trans. Brit. mycol. Soc.*, xxix, 1–2, pp. 70–73, 1 fig., 1946.

A species of *Chaetomium*, differing from *C. hispidum* Fries in not possessing scattered, rigid, divergent hairs, clavate asci, or ovate, yellowish spores, is named *Chaetomium tetrasporum* n. sp. Its distinctive features are the four-spored asci and the numerous small coils comprising the head.

GERSTEL (D. U.). **Inheritance in Nicotiana tabacum. XXI. The mechanism of chromosome substitution.**—*Genetics*, xxxi, 4, pp. 421–427, 1946.

In 1938 Holmes succeeded in substituting a chromosome from *Nicotiana glutinosa*, carrying the factor or factors of resistance to the tobacco mosaic virus, for one of tobacco by back-crosses for several generations of the amphidiploid to tobacco [*R.A.M.*, xvi, p. 417; xvii, p. 417; xxiv, p. 477] and thus produced the resistant Samsoun tobacco. In an investigation of the circumstances permitting such a substitution the author has shown that a similar substitution for a chromosome of the white Cuba tobacco occurred during meiosis in the pentaploid *N. tabacum-N. tabacum-N. glutinosa* parent.

GIGANTE (R.). **L'incurvamento apicale del Pomodoro.** [Apical curving of Tomato.] —*Boll. Staz. Pat. veg. Roma*, N.S., xx, 3, pp. 231–250, 1 pl., 10 figs., 1940. [Received June, 1946.]

In the spring of 1940, Cassalino tomatoes growing in an experimental field near Rome were observed to show a conspicuous downward curving of the stalks and

midribs of the leaves and leaflets on the upper part of the stem. The affected leaves were slightly thicker than healthy ones, rigid, tough, and brittle. The fruits appeared to be normal, but were rather fewer than on healthy plants, and showed a tendency to crack. No fungus or bacterium was present, and there was no sign of insect attack.

Stem and leaf inoculations either by injection or by rubbing gave rise to the original symptoms in ten days to three weeks. Inoculations of healthy tobacco and eggplants by rubbing the leaves with juice from infected tomato plants gave rise to local lesions in the forms of ringed spots in tobacco and in eggplants to minute spots which enlarged, became confluent, and formed circular, polygonal, or irregular necrotic areas.

Histological studies showed the presence of X-bodies in the cells of both the affected tomato leaves and the inoculated tobacco leaves; inoculated eggplant leaves showed a very simple necrosis.

It is concluded that the condition described on tomato plants is due to a virus or viruses producing on tomato, tobacco, and eggplant symptoms differing from those caused by the tomato viruses known at the time of writing.

BANGA (O.). **Een vergelijking van het voor meeldauw onvatbare Tomatenras 'Vetomold' met enkele Nederlandsche rassen van Kastomaten.** [A comparison of the mildew-immune Tomato variety 'Vetomold' with some Dutch glasshouse Tomato varieties.]—*Meded. TuinbVoorlicht. Dienst* 24, 40 pp., 21 figs., 4 graphs, 1941. [Received 1945.]

A full account is given of the comparative trials carried out in three Dutch experimental gardens with the Vetomold tomato, immune from leaf mould [*Cladosporium fulvum*] [*R.A.M.*, xxi, p. 172 *et passim*], and 11 varieties widely cultivated in Holland. Vetomold approximates in growth habit and fruit shape to Tuckswood and Potentate, neither of which produces a large number of grade A fruits; the immune variety is slightly inferior in this respect. At Wageningen the yield of Vetomold averaged about the same (2·8 kg. per plant) as that of all the other varieties except the heavy-cropping Ailsa Craig (3·4 kg.). At Naaldwijk, however, the yield of Vetomold was very low (1·4 kg. per plant). As regards earliness, Vetomold was more or less on a level with Radio, Tuckstir, Potentate, Ailsa Craig, Eminent, and Westlandia, the first 10 kg. of fruits on a plot of 32 plants being harvested 105 days after planting out, as compared with 95 to 97 for the four most precocious varieties. Leaf mould did not develop on Vetomold in any of the three localities, even when spore suspensions of *C. fulvum* were applied to the plants.

All things considered, Vetomold cannot yet compete with the leading Dutch glasshouse tomatoes, but it should be used as a parent in crosses designed to yield a product capable of a first-rate performance under all conditions. In this connexion the mode of inheritance of immunity from leaf mould [ibid., xii, p. 250; xvi, p. 571] is discussed.

SIBILIA (C.). **L'Ulmus pumila e la grafiosi.** [*Ulmus pumila* and graphiosis.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 2, pp. 147–149, 1 fig., 1940. [Received June, 1946.]

Up to the time of writing four cases of natural infection of *Ulmus pumila* by *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xix, p. 124] had been recorded, two in Holland [ibid., xiii, p. 549], and two in Italy [ibid., xvi, p. 353]. In July, 1939, from a four- to five-year-old *U. pumila* tree at Florence with one withered branch, and the current year's wood showing characteristic blackening, repeated isolations gave the mycelium of *C. ulmi*, with coremia. As this variety of elm is reproduced by seed, occasional variation in resistance is only to be expected, and no uneasiness need be felt on this score.